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WATER STORAGE CHARACTERISTICS OF 21 SOILS IN EASTERN SOUTH DAKOTA

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WATER STORAGE CHARACTERISTICS OF 21 SOILS IN EASTERN SOUTH DAKOTA[1]

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INTRODUCTION

One of the most important functions that the soil performs in crop production is that of acting as a storage medium for water used by growing plants. The objective of this study is to furnish information on the water-storage capacity of some of the important soils in eastern South Dakota.

SOILS STUDIED

The soils used in this study were all taken from cropland located primarily in east-central South Dakota. Thirty-eight sites, representing 21 distinct soil types, were sampled. A list, following the "Results" section of this report, gives the soil type on each site and the page where a detailed description and results can be found.

EXPERIMENTAL MEASUREMENTS

Sampling Technique

A pit was dug to expose a profile of the soil at each of the soil sites studied. Each soil profile was described and classified by one of the soil classifiers cooperating on the project. Two undisturbed samples about 6 cm. in diameter and 3.5 cm. in depth were taken from each horizon of the exposed profile with a modified Lutz-type sampler. A large bulk sample was also taken for subsequent mechanical analysis and other determinations. The disturbed samples were air dried for storage; the undisturbed samples were kept at initial field water content by taping all joints and openings in the sample cans which were then refrigerated until ready for water tension analysis.

Measurements Taken

Water Content–Tension Measurements

Water content of the undisturbed soil samples was measured at equilibrium with water tensions of 1/10, 1/3, 1, 5, and 15 bar(s). The average water content of duplicate samples at each equilibrium point is reported. Samples taken from the field were weighed so that field water content could be determined. They were then wetted to saturation by first soaking them in water to a depth of about 1/3 of the sample height and then adding small increments of water for about 3 days until the level of the water was above the sample. The water was then drained off, and the samples were immediately weighed so that saturation water content could be calculated. Each sample

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[1]Contribution from the North Central Soil Conservation Research Center, Corn Belt Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture, Brookings, S. Dak., in cooperation with the South Dakota Agricultural Experiment Station, Brookings, S. Dak.

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was weighed after being equilibrated with each of the above-mentioned water tensions and dried at 105° C.; water content at each equilibrium tension was calculated.

Bulk Density and Mechanical Analysis

Bulk density was determined from sample volume and the dry weight of the sample. The hydrometer technique was used to obtain a mechanical analysis of the bulk samples. Each determination for mechanical analysis was carried out in duplicate, and the mean of the two determinations is reported.

Calculation of Data

The water content at each of the tensions measured was calculated from the volume, wet weight at equilibrium, and dry weight of the soil sample as follows:

$$\text{Percent water (volume basis)} = \frac{(\text{Wet weight} - \text{dry weight})}{\text{Volume of sample}}$$

Bulk density was calculated as:

$$\text{Bulk density} = \frac{\text{Dry weight of sample}}{\text{Volume of sample}}$$

and the percentages of sand, silt, and clay were calculated from the calibrated hydrometer readings:

RESULTS

The remainder of this report contains the results of measurements for each of the sites studied and the profile description for that site. Where several profiles of the same soil were studied, the reader will have the opportunity to assess variations of soil characteristics within the same soil types. Profile descriptions follow the style used in USDA Soil Conservation Service, "Soil Survey Manual" and are written as of October 1969.

Soil Type	Page
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SOIL PROFILE DESCRIPTION

Soil Type: Beadle loam
Classification: Typic Argiustoll, fine, mixed, mesic
Area: Kingsburgy County, S. Dak.
Parent Material: Loamy glacial drift over firm glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Black (10YR 2/1) loam, dark gray (10YR 4/1.5) when dry; cloddy; hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 7.2; abrupt smooth boundary.
B21t	15-28	Dark-brown (10YR 3/3) clay loam, dark grayish brown (10YR 4/2.5) when dry; moderate medium prisms breaking to moderate medium blocks with thin patchy black (10YR 2.5/1.5, 4/2D) color coats and thin very patchy clay films; hard, firm, sticky, plastic; noncalcareous; pH 7.4; clear irregular boundary.
B22t	28-43	Very dark grayish-brown (2.5Y 3/2, 1.25Y 3/2R) clay loam, dark grayish brown (2.5Y 4/3, 4/2R) when dry; moderate medium prisms breaking to strong medium blocks with thin continuous very dark grayish-brown (1.25Y 3/2, 2.5Y 4/2D) color coats; thin distinct continuous clay films on horizontal ped faces, moderately thick continuous and thick very patchy clay films on vertical ped faces; very hard, firm, very sticky, plastic; ped interiors in lower part of horizon weakly calcareous; pH 7.6; abrupt irregular boundary.
B23ca	43-58	Dark grayish-brown (2.5Y 4/2.5) clay loam, light olive brown (2.5Y 5/3) when dry, with few fine distinct strong brown mottles; moderate coarse prisms breaking to moderate medium subangular blocks with thin continuous very dark grayish-brown (1.25Y 3.5/2, 4.5/2D) color coats; moderately thick very patchy clay films on vertical ped faces; all features very strongly ped oriented; very hard, firm, very sticky, plastic; strongly calcareous with common fine lime segregations; pH 8.0; clear wavy boundary.
B3ca	58-81	Olive-brown (2.5Y 4/3) clay loam, light yellowish brown (2.5Y 6/3) when dry, with many medium distinct olive-gray and common fine prominent strong brown mottles; weak coarse prisms with moderately thick very patchy clay films on vertical faces; very hard, firm, sticky, plastic; very strongly calcareous with many medium lime segregations; pH 8.2+; clear wavy boundary.
Clcacs	81-109	Oliver-gray (5Y 4.5/2, 5.5/2d) clay loam, with common medium distinct light olive brown, few medium prominent yellowish-red and common medium prominent black mottles; massive; very hard, firm sticky, plastic; very strongly calcareous with common fine lime segregations; common medium threads of gypsum; pH 8.2+; gradual wavy boundary.
C2cs	109-152	Gray (5Y 5/1.5, 6/1.5D) clay loam, common medium distinct light olive brown, few fine prominent yellowish-red, and common medium prominent black mottles; massive; very hard, firm, sticky, plastic; strongly calcareous with few fine lime segregations; common medium threads and nests of gypsum; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.23	42.0	39.0	35.7	30.2	30.0
B21T	15-28	1.25	38.5	34.6	32.3	29.6	27.5
B22t	28-43	1.36	41.8	38.9	37.0	34.8	33.5
B23ca	43-58	1.46	37.1	34.5	32.4	29.6	28.0
B3ca	58-81	1.47	38.0	35.3	33.4	30.0	28.3
Clcacs	81-109	1.46	39.4	36.0	33.9	30.0	28.3
C2cs	109-152	1.46	41.7	39.4	37.0	34.0	32.0

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	30.8	34.0	35.2	1.8	1.4
B21t	15-28	35.4	30.6	34.0	1.4	.9
B22t	28-43	34.4	23.4	42.2	1.3	.8
B23ca	43-58	26.4	25.6	48.0	1.4	1.0
B3ca	58-81	25.4	25.8	48.8	2.2	1.6
Clcacs	81-109	30.4	22.8	46.8	3.1	2.2
C2cs	109-152	29.4	24.8	45.8	4.2	3.1
Total available water in profile					15.4	11.0

SOIL PROFILE DESCRIPTION

Soil Type: Beadle silt loam
Classification: Typic Argiustoll, fine, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Firm clay loam glacial till
Relief: 1 percent plane with slope

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Black (10YR 2/1.5R) silt loam, dark grayish brown (10YR 4/2R) when dry; cloddy; slightly worm-worked, about 10 percent worm casts; slightly hard, friable, sticky, slightly plastic; noncalcareous; ph 6.4; abrupt smooth boundary.
B21t	18-30	Very dark graphish-brown (10YR 3/2, 2.5/2R) clay loam, dark gray (10YR 4.5/1, 4/2R) when dry; weak coarse and moderate fine subangular blocky structure; about 3 percent worm casts; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 6.7; clear smooth boundary.

Horizon	Depth	Description
	Cm.	
B22t	30-53	Dark grayish-brown (10YR 4/2.5, 4/2R) clay loam, brown (10YR 5/3, 4/2.5R) when dry; weak medium prisms breaking to strong medium and moderate fine blocks with dark grayish-brown (10YR 4/2, 5/2.5D) moderately thick continuous, and very dark-gray (10YR 3/15, 4/10) thin very patchy color coats; thick patchy clay films; hard, firm, sticky, plastic; noncalcareous; pH 7.1; clear irregular boundary.
B3ca	53-79	Light olive-brown (2.5Y 5/3) clay loam, light yellowish brown (2.5Y 6/3) when dry, with few fine faint olive-yellow and few fine distinct strong brown mottles; moderate medium and coarse prisms breaking to weak coarse blocks; olive-brown (2.5Y 4.5/3, 5/3D) moderately thick continuous color coats and thin very patchy clay films on vertical ped faces; very hard, firm, sticky, plastic; strongly calcareous with many medium lime segregations; pH 8.0; gradual wavy boundary.
C1ca	79-109	Olive-brown (2.5Y 4/4) clay loam, pale yellow (2.5Y 7/3) when dry, with many fine distinct grayish-brown, common fine prominent strong brown, and few fine prominent yellowish-red mottles; massive, very hard, firm, sticky, plastic; very strongly calcareous with common fine round lime segregations; pH 8.2+; diffuse wavy boundary.
C2ca	109-152	Olive-gray (2.5-5Y 5/2) clay loam, light olive gray (2.5-5Y 6/2) when dry, with many fine distinct dark-brown and few fine prominent strong brown and yellowish-red mottles; massive; very hard, firm; sticky, plastic; very strongly calcareous; few medium threads of gypsum; pH 8.0.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.12	43.6	40.6	35.9	30.3	27.2
B21t	18-30	1.20	38.1	34.0	30.8	25.1	22.8
B22t	30-53	1.37	38.7	35.9	33.3	29.3	27.7
B3ca	53-79	1.21	46.7	33.3	31.1	27.2	25.0
C1ca	79-109	1.38	46.1	34.2	32.0	27.0	24.6
C2ca	109-152	1.46	44.4	34.5	33.1	29.6	27.0

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	27.8	51.8	20.4	2.9	2.4
B21t	18-30	28.8	42.8	28.4	1.9	1.4
B22t	30-53	29.8	33.8	36.4	2.5	1.9
B3ca	53-79	32.8	26.8	40.4	5.5	2.1
Clca	79-109	32.8	26.8	40.4	6.5	2.9
C2ca	109-152	34.8	26.8	38.4	7.5	3.3
Total available water in profile					26.8	14.0

SOIL PROFILE DESCRIPTION

Soil Type: Beadle silt loam
Drainage: Well drained
Classification: Typic Argiustoll, fine, mixed, mesic
Area: Kingsburgy County, S. Dak.
Parent Material: Firm clay loam glacial till
Relief: Low, flat-topped hill

Horizon	Depth	Description
	Cm.	
Ap	0-13	Very dark-brown (10YR 2/2R) silt loam, dark grayish brown (10YR 4.5/2R) when dry; cloddy; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 6.8; abrupt smooth boundary.
B21t	13-25	Very dark grayish-brown (10YR 3.5/2, 3/2R) clay loam, grayish brown (1.25Y 5/2, 10YR 5/2R) when dry; moderate medium and fine subangular blocks with very dark-gray (10YR 3/1, 4/1D) thin very patchy color coats; thin very patchy clay films on vertical ped faces; hard, friable, sticky, slightly plastic; noncalcareous; pH 7.1; clear wavy boundary.
B22t	25-53	Very dark grayish-brown (1.25Y 2.5/2, 3/2R) clay loam, grayish brown (2.5Y 5/2) when dry; moderate medium prisms breaking to strong medium blocks with thick continuous clay films; very hard, firm, very sticky, plastic, noncalcareous; pH 7.4; abrupt wavy boundary.
B3ca	53-84	Light olive-brown (2.5Y 5/3.5) clay loam, light gray (2.5Y 7/2.5) when dry, with few fine prominent yellowish-red mottles; moderate coarse prisms breaking to weak coarse blocks; hard, friable, very sticky, plastic; very strongly calcareous with many medium irregular lime segregations; pH 8.2; clear irregular boundary.
Clcacs	84-107	Light olive-brown (2.5Y 5/3) clay loam, pale yellow (2.5-5Y 7/3) when dry, with common medium distinct gray, few fine prominent black, and few fine distinct olive-gray mottles; massive; hard, firm, very sticky, plastic; very strongly calcareous with common medium lime segregations; few fine irregular nests and few medium threads of gypsum; pH 8.2+; clear wavy boundary.

Horizon	Depth	Description
	Cm.	
C2ca	107-152	Olive (5Y 5/3) clay loam, pale yellow (5Y 7/3) when dry, with many medium distinct gray, common fine distinct black, and common fine prominent yellowish-red and strong brown mottles; massive; very hard, firm, very sticky, very plastic; strongly calcareous with few fine lime segregations; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.40	37.1	34.4	30.9	25.2	23.7
B21t	13-25	1.20	37.1	34.9	32.1	27.1	25.1
B22t	25-53	1.33	42.1	40.2	38.0	34.3	32.5
B3ca	53-84	1.34	41.0	38.4	36.0	30.8	28.3
Clcacs	84-107	1.48	37.0	34.2	31.6	27.0	23.8
C2ca	107-152	1.48	39.2	37.3	35.5	32.7	30.8

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	26.8	51.8	21.3	1.7	1.4
B21t	13-25	16.8	43.8	39.4	1.5	1.2
B22t	25-53	12.8	36.8	50.4	2.7	2.1
B3ca	53-84	14.8	37.8	47.4	2.6	2.1
Clcacs	84-107	39.8	25.8	34.4	3.0	2.4
C2ca	107-152	34.6	24.4	41.0	3.8	3.0
Total available water in profile					15.3	10.1

SOIL PROFILE DESCRIPTION

Soil Type: Clarno loam
Classification: Typic Haplustoll, fine-loamy, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Dark-gray (10YR 4/1) loam, black (10YR 2/1) when moist; weak fine granular structure; slightly hard when dry, very friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
B2	18-48	Grayish-brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic breaking to moderate coarse subangular blocky structure; thin patchy clay film; hard when dry, friable when moist; noncalcareous; pH 6.8; clear wavy boundary.
B3ca	48-74	Light brownish-gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) when moist; few fine faint light-gray (N7) mottles when dry; weak medium and coarse subangular blocky structure; slightly hard when dry, friable when moist; many fine and medium distinct soft lime concretions; strong effervescence; pH 8.6; gradual wavy boundary.
C1ca	74-91	Light-gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) when moist; common fine faint brownish-yellow (10YR 6/6) and common fine and medium distinct light-gray (N7) mottles when dry; massive; slightly hard when dry, friable when moist; common fine and medium distinct soft lime concretions; strong effervescence; pH 8.6; gradual wavy boundary.
C2	91-152	Light-gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) when moist; common fine faint brownish-yellow (10YR 6/6), a few fine distinct strong brown (7.5 YR 5/6), common fine and medium distinct light-gray (N7), and a few fine distinct black (2.5Y 2/0) mottles when dry; massive; hard when dry; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.28	39.0	34.8	32.0	26.2	22.3
B2	18-48	1.26	37.3	33.0	30.9	25.9	22.7
B3ca	48-74	1.28	35.8	31.4	28.3	21.9	18.0
C1ca	74-91	1.38	38.0	33.5	30.4	24.1	18.6
C2	91-152	1.42	36.9	33.6	31.2	24.6	18.5

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle Size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	36.4	35.8	27.8	3.0	2.2
B2	18-48	40.6	28.6	30.8	4.4	3.1
B3ca	48-74	33.4	34.6	32.0	4.5	3.4
Clca	74-91	35.6	34.6	29.8	3.5	2.6
C2	91-152	32.2	39.6	28.2	11.3	9.2
Total available water in profile					26.7	20.5

SOIL PROFILE DESCRIPTION

Soil Type: Dempster silt loam
Drainage: Well drained
Classification: Udic Haplustolls, fine-silty, over sandy or sandy-skeletal, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty alluvium overlying sand and gravel
Relief: Convex

Horizon	Depth	Description
	Cm.	
Ap	0-18	Dark-gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) when moist; cloddy breaking to weak fine granular structure; slightly hard when dry, very friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
B21	18-48	Dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; weak to moderate medium and coarse prismatic breaking to moderate medium and coarse subangular blocky structure; slightly hard when dry, friable when moist; noncalcareous; pH 7.0; gradual wavy boundary.
B22	48-84	Light brownish-gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic breaking to moderate fine prismatic and to moderate coarse subangular blocky structure; slightly hard when dry, friable when moist; thin patchy clay films; noncalcareous; pH 7.8; clear wavy boundary.
Cca	84-97	Light brownish-gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) when moist, few fine faint brownish-yellow (10YR 6/6) mottles when dry; massive; many fine and medium distinct lime concretions; strong effervescence; pH 8.2; clear wavy boundary.
IIc	97-152	Brown (10YR 5/3) gravel and sand, dark brown (10YR 3/3) when moist; single grain; loose when dry, loose when moist; strong effervescence; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1Bar	5Bars	15Bars
	Cm.	*G./cc.*					
Ap	0-18	1.14	48.5	37.0	29.3	21.8	19.1
B21	18-48	1.11	43.2	35.6	30.5	25.2	24.0
B22	48-84	1.26	40.8	37.7	33.8	27.1	23.6
Cca	84-97	1.34	34.4	31.8	27.8	21.5	18.4
IIC	97-152	1.56	13.1	11.7	10.2	7.9	7.5

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	24.4	47.4	28.2	4.7	3.2
B21	18-48	18.6	51.3	30.1	5.8	3.5
B22	48-84	18.8	49.6	31.6	6.1	5.0
Cca	84-97	45.0	32.2	22.8	2.0	1.7
IIc	97-152	90.8	5.4	3.8	3.1	2.3
Total available water in profile					21.7	15.7

SOIL PROFILE DESCRIPTION

Soil Type: Dempster silt loam
Drainage: Well drained
Classification: Udic Haplustoll, fine-silty, over sandy or sandy-skeletal, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty alluvium overlying outwash sand and gravel
Relief: Concave

Horizon	Depth	Description
	Cm.	
Ap	0-15	Dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; cloddy breaking to weak fine granular structure; slightly hard when dry, very friable when moist; noncalcareous; pH 6.4; abrupt smooth boundary.
B21	15-43	Dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; weak and moderate prismatic breaking to moderate medium subangular blocky structure; slightly hard when dry, friable when moist; noncalcareous; pH 6.8; gradual wavy boundary.
B22	43-84	Light-gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic structure; thin patchy clay film; slightly hard when dry, friable when moist; noncalcareous; pH 7.0; clear wavy boundary.
Cca	84-97	Light brownish-gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) when moist; massive; hard when dry, friable when moist; many fine and medium distinct hard lime concretions; strong effervescence; pH 8.2; clear wavy boundary.
IIC	97-152	Brown (10YR 5/3) gravel and sand, dark brown (10YR 3/3) when moist; single grain structure; loose when dry, loose when moist; slight efferverscence; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.17	44.2	40.5	35.6	30.4	27.2
B21	15-43	1.09	37.5	32.2	26.3	21.9	20.0
B22	43-84	1.22	36.6	33.7	30.6	26.5	23.5
Cca	84-97	1.46	12.4	10.8	9.0	7.4	6.9
IIC	97-152	1.39	11.0	9.5	8.6	7.6	7.2

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	23.2	46.0	30.8	2.6	2.0
B21	15-43	17.2	47.8	35.0	4.9	3.4
B22	43-84	21.0	47.0	32.0	5.3	4.1
Cca	84-97	83.6	8.2	8.2	.7	.5
IIC	97-152	89.8	4.0	6.2	2.1	1.3
Total available water in profile					15.6	11.3

SOIL PROFILE DESCRIPTION

Soil Type: Dudley silt loam
Classification: Typic Natrustoll, fine, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Firm clay loam glacial till
Relief: Concave

Drainage: Somewhat poorly drained

Horizon	Depth	Description
	Cm.	
A1	0-13	Black (10YR 2/1) silt loam, gray (10YR 5/1.5, 4.5/1.5R) when dry; weak coarse and moderate fine and very fine granular structure; soft, very friable, slightly sticky, slightly plastic; noncalcareous; pH 6.0; abrupt smooth boundary.
A2	13-25	Very dark-gray (10YR 3/1R) loam, gray (10YR 5/1R) when dry; weak coarse plates breaking to moderate fine and very fine plates with very dark-gray undersides (10YR 3/1, 4/1D) and tops (10YR 3.5/1, 6/1D); round translucent unstained quartz; few very fine continuous single vertical pores; soft, very friable, slightly sticky, slightly plastic; noncalcareous; pH 6.2; abrupt irregular boundary.
A2&B2	25-30	Black (10YR 2/1.5, 2/1R) silty clay loam, very dark gray (10YR 3/1.5) when dry: moderate fine and very fine blocks breaking to very fine subangular blocks with thin continuous very dark-gray (10YR 3.5/1, 5/1D) color coats that are thickest in upper part of horizon; round translucent unstained quartz; few very fine continuous single vertical pores; hard, firm, sticky, plastic; noncalcareous; pH 6.6; abrupt irregular boundary.
B21t	30-46	Very dark-brown (10YR 2/2, 2/1R) clay, dark grayish brown (10YR 4/2) when dry; very strong medium columns breaking to strong coarse blocks; column tops degraded to very fine blocks; thin continuous very dark-gray (10YR 2.5/1, 1.25Y 4/1D) color coats and thin distinct very patchy clay films; round translucent and transparent unstained quartz; very hard, extremely firm, very sticky, very plastic; noncalcareous; pH 6.6; clear wavy boundary.
B22t	46-71	Black (1.25Y 2/1, 2.5Y 2/1R) clay, dark gray (2.5Y 3.5/1) when dry; very strong coarse prisms breaking to strong coarse blocks with thin continuous very dark-gray (10YR 2.5/1, 1.25Y 4/1D) color coats; thin distinct very patchy clay films on vertical ped faces, moderately thick continuous clay films on horizontal ped faces; round translucent unstained and round transparent iron-stained quartz; very hard, extremely firm, very sticky, very plastic; noncalcareous; pH 6.8; wavy boundary.
B23t	71-91	Dark-gray (2.5Y 4.5/1) clay, gray (5Y 5/1) when dry, with few fine prominent yellowish-red mottles; weak coarse prisms with thin very patchy clay films on vertical faces and thin continuous clay films on horizontal faces; very hard, very firm, very sticky, very plastic; noncalcareous; pH 7.1; clear wavy boundary.
B3cs	91-109	Olive-gray (5Y 4/2, 5/2D) clay, with many fine distinct light olive-brown, many fine faint dark-gray, common fine prominent strong brown, and many fine prominent black mottles; very weak coarse prismatic structure; very hard, firm, very sticky very plastic; weakly calcareous with few fine lime segregations; few fine nests and common coarse threads of gypsum; pH 7.8; abrupt irregular boundary.

Horizon	Depth	Description
	Cm.	
C1ca	109-132	Olive-gray (5Y 5/2) clay loam, light olive gray (5Y 6/2) when dry, with many fine distinct light olive-brown, common medium strong brown, and yellowish-red, and common fine distinct black mottles; massive; hard, firm, sticky, plastic; strongly calcareous with common medium segregations and common medium concretions of lime; pH 8.2+; gradual wavy boundary.
C2ca	132-152	Olive-gray (5Y 5/2) clay loam, light olive gray (5Y 6/2) when dry, with common medium distinct light olive-brown, many medium prominent strong brown, and many medium prominent black mottles; massive; hard, firm, sticky, plastic; strongly calcareous with common fine segregations and few medium concretions of lime; pH 8.0.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-13	0.87	46.9	42.1	36.4	30.0	22.3
A2	13-25	1.10	38.7	34.4	30.9	25.9	23.8
A2&B2	25-30	1.19	37.3	34.3	31.3	27.3	25.5
B21t	30-46	1.47	45.9	43.4	41.3	38.0	36.0
B22t	46-71	1.51	46.5	44.0	41.9	38.5	37.0
B23t	71-91	1.50	43.4	40.6	38.8	35.4	34.0
B3cs	91-109	1.38	44.4	41.5	39.3	35.8	33.8
C1ca	109-132	1.32	38.9	36.0	33.7	29.5	27.8
C2ca	132-152	1.42	41.1	38.9	36.9	33.0	31.4

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-13	27.8	57.6	14.6	3.1	2.5
A2	13-25	29.8	46.6	23.6	1.9	1.3
A2&B2	25-30	28.8	38.6	32.6	.6	.5
B21t	30-46	21.2	30.8	48.0	1.5	1.1
B22t	46-71	17.8	33.8	48.4	2.4	1.8
B23t	71-91	18.8	35.8	45.4	1.9	1.3
B3cs	91-109	29.8	25.8	44.4	1.9	1.4
C1ca	109-132	30.8	26.8	42.4	2.5	1.9
C2ca	132-152	32.8	24.8	42.4	2.0	1.5
Total available water in profile					17.8	13.3

SOIL PROFILE DESCRIPTION

Soil Type: Dudley silt loam
Classification: Typic Natrustroll, fine, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Firm clay loam glacial till
Relief: Concave

Drainage: Somewhat poorly drained

Horizon	Depth	Description
	Cm.	
A1	0-9	Very dark-gray (10YR 3/1.5, 2/1R) silt loam, gray (10YR 5/1.5) when dry; moderate medium and very fine granular structure; soft, very friable, slightly sticky, slightly plastic; noncalcareous; pH 5.6; clear smooth boundary.
A2	9-17	Dark-gray (10YR 4/1, 4/1.5R) loam, light gray (10YR 7/1, 6/1.5R) when dry; weak medium and coarse, and moderate fine platy structure; few fine continuous single vertical pores; soft, very friable, slightly sticky, slightly plastic; noncalcareous; pH 6.0; abrupt irregular boundary.
A2&B2	17-20	Very dark-gray (10YR 3/1) clay loam, dark gray (10YR 4.5/1, 5/1.5R) when dry; weak coarse plates breaking to moderate fine and very fine blocks with thin continuous dark-gray (10YR 3.5/1, 6.5/1D) color coats; few fine continuous single vertical pores; hard, friable, sticky, plastic; noncalcareous; pH 6.5; abrupt irregular boundary.
B21t	20-38	Very dark-gray (10YR 3/1) clay, gray (2.5Y 5/1) when dry; strong medium columns and very coarse prisms breaking to strong medium blocks; thin patchy clay films on vertical ped faces; very hard, extremely firm, very sticky, very plastic; noncalcareous; pH 6.9; gradual smooth boundary.
B22t	38-61	Very dark-gray (2.5Y 3/1) clay, gray (2.5Y 5/1) when dry; strong very coarse prismatic and strong coarse blocky structure; thin continuous and moderately thick patchy clay films; very hard, extremely firms, very sticky, very plastic; noncalcareous; pH 6.9; clear wavy boundary.
B3	61-76	Dark grayish-brown (2.5Y 4/2) clay, grayish brown (2.5Y 5/2) when dry; weak very coarse prisms breaking to weak coarse blocks with thin patchy very dark-gray (2.5Y 3.5/1, 5/1D) color coats and thin patchy clay films; very hard, firm, sticky, plastic; weakly calcareous; pH 7.3; abrupt wavy boundary.
Clca	76-112	Gray (5Y 5/1) clay loam, light gray (5Y 7/1) when dry, with many fine faint olive, common fine prominent black, few medium prominent reddish-brown, and few fine distinct olive-yellow mottles; massive; very hard, firm, sticky, plastic; strongly calcareous with common fine lime concretions and few fine segregations; pH 8.0; diffuse smooth boundary.
C2ca	112-152	Light olive-gray (5Y 6/2) clay loam, light gray (5Y 7/2) when dry, with many fine and medium prominent reddish-yellow, common fine faint light olive-brown, and few fine prominent dark reddish-brown mottles; massive; very hard, firm, sticky, plastic; strongly calcareous with common fine threads of lime; pH 7.7.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-9	0.97	45.9	39.3	35.3	30.5	26.7
A2	9-17	1.19	37.8	32.0	29.3	25.4	22.6
A2&B2	17-20	1.27	34.7	31.3	28.9	24.8	23.1
B21t	20-38	1.49	44.4	41.9	39.8	36.0	34.1
B22t	38-61	1.48	45.4	42.8	40.7	37.3	35.3
B3	61-76	1.50	40.4	37.9	35.7	32.4	30.5
Clca	76-112	1.36	37.8	34.3	31.7	26.8	24.4
C2ca	112-152	1.38	35.6	32.4	30.0	26.3	24.2

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-9	28.6	56.6	14.8	1.7	1.1
A2	9-17	29.6	48.6	21.8	1.1	.7
A2&B2	17-20	26.6	40.4	33.0	.4	.3
B21t	20-38	18.6	35.4	46.0	2.0	1.4
B22t	38-61	20.6	33.4	46.0	2.3	1.7
B3	61-76	28.6	29.4	42.0	1.5	2.3
Clca	76-112	45.6	26.6	27.8	4.7	3.5
C2ca	112-152	36.2	30.0	33.8	4.6	3.3
Total available water in profile					18.3	14.3

SOIL PROFILE DESCRIPTION

Soil Type: Egan silty clay loam
Classification: Udic Haplustoll, fine-silty, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty material overlying glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
A1	0-18	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak fine granular structure; slightly hard when dry, very friable when moist; noncalcareous; pH 6.8; clear smooth boundary.
B21	18-36	Grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic breaking to weak and moderate medium and coarse subangular blocky structure; thin patchy clay films; hard when dry, friable when moist; noncalcareous; pH 7.0; gradual wavy boundary.
B22	36-58	Light olive-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium and coarse prismatic breaking to moderate medium and coarse subangular blocky structure; thin patchy clay film; hard when dry, friable when moist; noncalcareous; pH 7.0; clear wavy boundary.
B3ca	58-74	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; common fine distinct light olive-brown (10YR 5/5 and 10YR 5/8) mottles when dry; moderate medium and coarse subangular blocky structure; hard when dry, friable when moist; many fine and medium distinct soft lime concretions and few medium distinct iron concretions; strong effervescence; pH 8.2; gradual wavy boundary.
IIC1	74-114	Light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) when moist; common fine and medium faint and distinct brownish-yellow, few fine distinct black (2.5Y 2/0), and few fine and medium distinct light gray (N7) mottles when dry; massive; hard when dry, firm when moist; common fine and medium distinct lime concretions; strong effervescence; pH 8.4; gradual wavy boundary.
IIC2	114-152	Light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) when moist; common fine faint brownish-yellow (10YR 6/8), few fine distinct yellowish-red (5YR 5/8), and common fine and medium distinct light gray (N7) mottles when dry; massive; hard when dry, firm when moist; few fine distinct lime concretions; strong effervescence; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-18	1.05	47.3	43.3	38.0	31.9	31.0
B21	18-36	1.14	43.6	38.8	34.9	30.8	30.1
B22	36-58	1.21	40.3	35.0	30.6	24.9	22.9
B3ca	58-74	1.26	40.1	35.1	30.9	23.1	21.1
IIC1	74-114	1.25	45.7	41.6	38.2	31.7	29.2
IIC2	114-152	–	–	–	–	–	–

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-18	21.0	50.2	28.8	2.9	2.2
B21	18-36	19.0	49.2	31.8	2.4	1.5
B22	36-58	14.8	53.2	32.0	4.0	2.8
B3ca	58-74	21.0	47.2	31.8	2.9	2.1
IIC1	74-114	29.0	28.2	42.8	5.0	3.6
IIC2	114-152	--	--	--	–	–
Total available water in profile					17.2	12.2

SOIL PROFILE DESCRIPTION

Soil Type: Egan silty clay loam
Classification: Udic Haplustoll, fine-silty, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty material overlying glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak fine granular structure; slightly hard when dry, very friable when moist; noncalcareous, pH 6.6; clear smooth boundary.
B21	18-41	Dark-gray to dark grayish-brown (10YR 4/1.5) silt loam, with tongues of grayish brown (2.5Y 5/2); very dark gray (10YR 3/1) with tongues of dark grayish brown (2.5Y 4/2) when moist; weak to moderate medium prismatic structure breaking to weak to moderate coarse subangular blocky; slightly hard when dry, friable when moist; thin patchy clay film; noncalcareous; pH 6.8; gradual wavy boundary.

Horizon	Depth	Description
	Cm.	
B22	41-58	Grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; weak to moderate medium and coarse prismatic structure breaking to weak to moderate coarse and medium subangular bocky; slightly hard when dry, friable when moist; thin patchy clay film; noncalcareous; pH 7.0; clear wavy boundary.
B3ca	58-76	Light brownish-gray (2.5Y 6/2.5) silty clay loam, dark grayish brown to grayish brown (2.5Y 4.5/2) when moist, with common fine and medium distinct yellowish-brown (10YR 5/6, 5/8) mottles; moderate coarse subangular blocky structure breaking to weak medium subangular blocky; hard when dry, friable when moist; thin patchy clay skin; strong effervescence; with many fine and medium distinct soft concretions; pH 8.2; gradual wavy boundary.
C1ca	76-97	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist, with many fine and medium distinct yellowish-brown (10YR 5/6, 5/8) mottles; massive; hard when dry, friable when moist; strong effervescence, with many fine and medium distinct soft lime concretions; pH 8.4; clear wavy boundary.
IIC2ca	97-152	Light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) with many fine distinct gray (5Y 6/1) mottles when moist, with many fine and medium distinct yellowish-brown (10YR 5/6, 5/8), few fine distinct black (2.5Y 2/10), and many fine distinct light-gray (5Y 7/1) mottles; massive; very hard when dry, firm when moist; strong effervescence, with common fine and medium distinct lime concretions; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.08	43.2	38.9	34.8	22.5	19.6
B21	18-41	1.17	39.4	34.4	31.0	22.6	19.3
B22	41-58	1.23	38.5	33.8	30.1	21.2	17.8
B3ca	58-76	1.24	37.5	32.3	29.2	21.7	17.6
C1ca	76-97	1.28	38.6	34.1	30.7	20.8	18.4
IIC2ca	97-152	1.28	38.2	34.0	31.4	23.8	21.5

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	19.8	51.2	29.0	4.2	3.4
B21	18-41	19.8	49.2	31.0	4.6	3.5
B22	41-58	18.8	51.2	30.0	3.7	2.9
B3ca	58-76	20.6	49.4	30.0	3.5	2.6
C1ca	76-97	22.6	45.4	32.0	4.1	3.2
IIC2ca	97-152	40.4	23.6	36.0	9.3	7.0
Total available water in profile					29.4	22.6

SOIL PROFILE DESCRIPTION

Soil Type: Ethan loam
Classification: Typic Haplustoll, fine-loamy, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Friable glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-13	Dark-gray (10YR 4/1) loam, black (10YR 2/1) when moist; weak fine granular structure; slightly hard when dry, friable when moist; strong effervescence; pH 7.2; abrupt smooth boundary.
C1ca	13-41	Light brownish-gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) when moist; fine common faint pale-brown (10YR 6/3) and brownish-yellow (10YR 6/6) mottles when dry; weak coarse subangular blocky structure; thin patchy clay film; slightly hard when dry, friable when moist; many fine and medium distinct lime concretions; strong effervescence; pH 8.2; gradual wavy boundary.
C2ca	41-91	Light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) and black (10YR 2/1) when moist; fine common faint brownish-yellow (10YR 6/6) mottles when dry; weak coarse and very coarse subangular blocky structure; slightly hard when dry, friable when moist; many fine and medium distinct lime concretions; strong effervescence; pH 8.2; clear wavy boundary.
C3	91-117	Light-gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) when moist; fine common faint yellowish-brown (10YR 5/8) mottles when dry; moderate coarse and very coarse subangular blocky structure; hard when dry, firm when moist; strong effervescence; pH 8.4; clear wavy boundary.
C4	117-152	Light-gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) when moist; many fine and medium faint and distinct brownish-yellow (10YR 6/6) and few fine distinct yellowish-red (5YR 4/8) mottles when dry; massive; very hard when dry, firm when moist; few fine distinct lime concretions; stong effervescence; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.12	43.4	38.0	34.2	29.8	29.2
C1ca	13-41	1.40	32.8	27.5	24.6	21.2	20.8
C2ca	41-91	1.35	26.1	21.7	19.6	17.6	17.3
C3	91-117	1.41	27.9	24.7	22.8	20.5	20.2
C4	117-152	--	--	--	--	--	--

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	38.8	32.2	29.0	1.8	1.1
C1ca	13-41	48.8	17.0	34.2	3.4	1.9
C2ca	41-91	67.8	9.2	23.0	4.4	2.2
C3	91-117	74.8	6.2	19.0	2.0	1.1
C4	117-152	--	--	--	--	--
Total available water in profile					11.6	6.3

SOIL PROFILE DESCRIPTION

Soil Type: Ethan loam
Classification: Typic Haplustoll, coarse-loamy, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Friable glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Dark-gray (10YR 4/1) loam, very dark gray (10YR 3/1) when moist; cloddy breaking to weak fine granular structure; soft when dry, very friable when moist; strong effervescence; pH 8.0; abrupt smooth boundary.
C1ca	15-48	Light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) when moist; weak to moderate medium and coarse subangular blocky structure; thin patchy clay film; slightly hard when dry, friable when moist; many fine and medium distinct soft and hard lime concretions; strong effervescence; pH 8.2; gradual wavy boundary.
C2ca	48-76	Light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) when moist; many fine faint and distinct brownish-yellow (10YR 6/6) mottles when dry; weak very coarse subangular blocky structure; hard when dry, firm when moist; many fine and medium distinct soft and hard lime concretions, also few fine distinct iron concretions; strong effervescence; pH 8.4; gradual wavy boundary.
C3	76-152	Light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) when moist; many fine faint and distinct brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/8) mottles when dry; massive; hard when dry, firm when moist; few fine distinct iron concretions; strong effervescence; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.20	32.8	28.8	26.0	19.9	16.9
C1ca	15-48	1.30	31.1	27.6	25.5	19.5	16.5
C2ca	48-76	1.34	23.7	20.8	18.6	14.9	12.6
C3	76-152	1.49	24.8	21.4	17.5	14.6	12.5

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	46.8	32.8	20.4	2.4	1.8
C1ca	15-48	43.8	28.8	27.4	4.8	3.7
C2ca	48-76	68.8	18.0	13.2	3.7	2.7
C3	76-152	66.8	18.0	15.2	9.3	6.8
Total available water in profile					20.2	15.0

SOIL PROFILE DESCRIPTION

Soil Type: Houdek loam
Classification: Typic Argiustolls, fine-loamy, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Friable glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Black (10YR 2/1.5R) loam, dark gray (10YR 4/1.5R) when dry; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; noncalcareous; pH 6.7; abrupt wavy boundary.
B2t	18-43	Dark grayish-brown (1.25Y 4/2, 3.5/2R) clay loam, brown (1.25Y 5/3, 4.5/3R) when dry, moderate medium prisms breaking to moderate medium blocks with thin continuous dark-brown (10YR 3.5/2.5, 5/2D) and thin very patchy very dark grayish-brown (10YR 3.5/2, 5/2D) color coats; moderately thick patchy clay films; hard, sticky, plastic; noncalcareous; pH 6.8; abrupt wavy boundary.
B3ca	43-76	Light olive-brown (2.5Y 5/3) clay loam, light yellowish brown (2.5Y 6/3) when dry; with common fine distinct dark yellowish-brown and common fine faint light olive-brown mottles; moderate coarse prisms breaking to weak coarse blocks; thin very patchy clay films on vertical ped faces; hard, friable, sticky, plastic; very strongly calcareous with many medium irregular lime segregations; pH 7.8; gradual wavy boundary.
C1ca	76-117	Olive (2.5-5Y 5/3) loam, pale yellow (2.5-5Y 7/3) when dry, with few fine faint olive-gray, few medium prominent strong brown, and many fine faint light yellowish-brown mottles; massive; hard, friable, sticky, plastic; very strongly calcareous with many fine and medium irregular lime segregations; pH 8.2+; gradual wavy boundary.
C2	117-152	Olive (2.5-5Y 5/4) loam, pale yellow (2.5-5Y 7/3) when dry, with common fine distinct gray, few fine prominent strong brown, and common fine faint olive-yellow mottles; massive; hard, friable, sticky, plastic; strongly calcareous; few medium irregular nests and few medium treads of gypsum; pH 8.0.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.04	57.4	38.3	35.5	28.7	25.2
B2t	18-43	1.20	53.7	29.4	26.7	22.5	21.1
B3ca	43-76	1.34	46.7	27.8	26.0	22.3	19.5
C1ca	76-117	1.39	34.7	31.9	28.9	23.8	20.9
C2	117-152	1.41	36.0	33.3	30.8	25.3	22.3

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	40.8	47.0	12.2	5.7	2.3
B2t	18-43	36.8	35.0	28.2	8.3	2.1
B3ca	43-76	33.8	32.0	34.2	9.0	2.7
C1ca	76-117	35.8	32.0	32.2	5.6	4.5
C2	117-152	42.8	34.4	22.8	4.9	3.9
Total available water in profile					33.5	15.5

SOIL PROFILE DESCRIPTION

Soil Type: Houdek loam
Drainage: Well drained
Classification: Typic Argiustolls, fine-loamy, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Friable glacial drift
Relief: Convex

Horizon	Depth	Description
	Cm.	
Ap	0-15	Black (10YR 2/1.5R) loam, dark gray (10YR 4/1R) when dry; weak fine subangular blocky structure; slightly hard, very friable, sticky, slightly plastic; noncalcareous; pH 7.4; abrupt smooth boundary.
B21t	15-28	Dark-brown (10YR 3/3, 3/2R) clay loam, dark grayish brown (10YR 4/2.5, 4/2R) when dry; weak medium prisms breaking to moderate coarse blocks with moderately thick continuous very dark grayish-brown (10YR 3/2, 4/2D) color coats; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 7.4; clear smooth boundary.
B22t	28-46	Brown (1.25Y 4/3, 2.5Y 4/3R) clay loam, pale brown (1.25Y 6/3, 2.5Y 5/3.5R) when dry; weak coarse and moderate medium prisms breaking to moderate coarse blocks with thin continuous color coats and thin very patchy clay films; hard, firm, sticky, plastic; noncalcareous; pH 7.8; abrupt smooth boundary.
B3ca	46-66	Olive-brown (2.5Y 4.5/4, 4/3R) loam, light yellowish brown (2.5Y 6.5/4, 5/3R) when dry, with few fine distinct strong brown mottles; weak coarse prisms breaking to very weak coarse blocks; hard, friable, slightly sticky, slightly plastic; very strongly calcareous with common medium round lime segregations; pH 8.0; gradual wavy boundary.
C1ca	66-102	Light olive-brown (2.5Y 5/4) clay loam, pale yellow (2.5Y 7/3) when dry, with few fine distinct strong brown mottles; massive; hard, friable, sticky, slightly plastic; very strongly calcareous with common coarse irregular lime segregations; pH 8.2; diffuse wavy boundary.

Horizon	Depth	Description
	Cm.	
C2ca	102-152	Light olive-brown (2.5Y 5/4) clay loam, pale yellow (5Y 7/3) when dry, with common fine prominent yellowish-red and strong brown mottles; massive; hard, friable, sticky, slightly plastic; very strongly calcareous with few medium irregular lime segregations; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.19	40.1	34.3	30.9	24.1	21.3
B21t	15-28	1.33	34.8	31.0	27.9	22.5	20.6
B22t	28-46	1.28	31.8	27.3	24.3	19.9	18.5
B3ca	46-66	1.39	30.8	26.7	22.9	16.5	14.2
C1ca	66-102	1.38	33.7	30.7	27.1	21.6	19.5
C2ca	102-152	1.43	34.4	31.1	28.3	22.0	18.5

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	41.1	46.7	12.2	2.9	2.0
B21t	15-28	41.4	32.4	26.2	1.8	1.3
B22t	28-46	41.2	30.6	28.2	2.4	1.5
B3ca	46-66	43.2	30.6	26.2	3.4	2.5
C1ca	66-102	41.2	29.6	29.2	5.1	4.0
C2ca	102-152	41.2	30.6	28.2	8.1	6.4
Total available water in profile					23.7	17.7

SOIL PROFILE DESCRIPTION

Soil Type: Kranzburg loam
Classification: Typic Haploborolls, fine-silty, mixed
Area: Kingsburg County, S. Dak.
Parent Material: Loamy superglacial drift over varved Cary (Flint) lacustrine silts
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-13	Very dark-gray (10YR 3/1, 2.5/1.5R) loam, dark gray (10YR 4/1, 4/1.5R) when dry; cloddy; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 7.8; abrupt smooth boundary.
B21t	13-30	Dark-brown (10YR 3.5/3, 4/2.5R) clay loam, brown (1.25Y 5/3, 10YR 5.5/3R) when dry; weak fine prisms breaking to weak angular blocks with dark grayish-brown (10YR 4/2, 5/2.5D) thin continuous color coats; thin very patchy clay films on vertical ped faces; hard, friable, sticky, plastic; noncalcareous; pH 7.8; gradual wavy boundary.
B22t	30-51	Dark grayish-brown (2.5Y, 10YR 4/2R) silty clay loam, grayish brown (2.5Y 5.5/3, 1.25Y 5/3R) when dry; weak medium prisms and coarse blocks breaking to moderate medium subangular blocks with very dark grayish-brown (10YR 3/2.5, 5/2.5D) thin continuous color coats and moderately thick patchy clay films; hard, friable, sticky, slightly plastic; noncalcareous; pH 7.4; abrupt wavy boundary.
B3ca	51-91	Light olive-brown (2.5Y 5/4) silt loam, pale yellow (2.5Y 7/4) when dry; with common fine faint olive-yellow mottles; moderate medium prisms breaking to weak coarse blocks; hard, firm, slightly sticky, slightly plastic; strongly calcareous with common medium round lime segregations; pH 8.2+; abrupt smooth boundary.
C1ca	91-104	Yellowish-brown (10YR 5/6) silt loam, yellow (10YR 7/6) when dry, with common fine faint strong brown, common fine distinct light olive-brown, and few fine faint yellowish-red mottles; massive; breaking to sharply angular fragments; very hard, friable, slightly sticky, slightly plastic; very strongly calcareous with common medium irregular lime segregations oriented in lines parallel to the surface; pH 8.2+; abrupt smooth boundary.
C2ca	104-152	Olive-gray (5Y 5/2) silt loam, varves with dark reddish-brown and black concretions separated by fine bands of strong brown (7.5YR 5/6 and 5/8) very fine sand; very hard, firm, slightly sticky, slightly plastic; very strongly calcareous with common fine irregular lime segregations in finer part of varves; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.20	43.5	37.2	32.7	25.0	22.3
B21t	13-30	1.36	34.6	30.2	27.1	21.6	19.5
B22t	30-51	1.26	36.4	31.9	29.0	24.4	22.4
B3ca	51-91	1.32	38.7	35.8	32.7	26.4	23.0
C1ca	91-104	1.35	43.7	40.8	38.0	31.2	25.2
C2ca	104-152	1.40	42.4	39.8	37.5	31.8	28.4

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	28.8	38.0	33.2	2.7	1.9
B21t	13-30	36.8	36.0	27.2	2.7	1.9
B22t	30-51	18.2	47.6	34.2	2.8	1.9
B3ca	51-91	15.2	49.6	35.2	6.4	5.2
C1ca	91-104	16.2	51.6	32.2	2.3	2.0
C2ca	104-152	20.2	42.6	37.2	6.8	5.5
Total available water in profile					23.7	18.4

SOIL PROFILE DESCRIPTION

Soil Type: Kranzburg silty clay loam
Classification: Udic Haploboroll, fine-silty, mixed
Area: Kingsburg County, S. Dak.
Parent Material: Silty Cary (Flint) drift over firm glacial till
Relief: 2-½ percent SE plane slope

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Very dark-brown (10YR 2.5/2R) silt loam, dark grayish brown (10YR 4/2R) when dry; cloddy; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 6.8; clear wavy boundary.
B21	15-28	Brown (10YR 4/3, 4/2R) silt loam, pale bown (10YR 6/3, 5/2.5R) when dry; weak medium prisms breaking to weak coarse blocks with dark grayish-brown (10YR 4/2.5, 5/2.5D) thin continuous color coats; thin very patchy clay films on vertical ped faces; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 7.0; clear wavy boundary.

Horizon	Depth	Description
	Cm.	
B22	28-43	Brown (1.25Y 4.5/3, 2.5Y 4.5/2.5R) silt loam, pale brown (1.25Y 6/3, 2.5Y 5.5/2.5R) when dry; weak medium prisms breaking to weak coarse blocks; very patchy moderately thick clay films on vertical ped faces; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 7.0; abrupt wavy boundary.
B23ca	43-56	Light olive-brown (2.5Y 5/3, 4.5/3R) silty clay loam, light yellowish brown (2.5Y 6/3, 7/2R) when dry; weak medium prisms breaking to very weak coarse blocks; patchy moderately thick clay films on vertical ped faces; hard, friable, slightly sticky, slightly plastic; strongly calcareous; pH 7.0; clear wavy boundary.
IIB31ca	56-69	Dark grayish-brown (2.5Y 4/2, 1.25Y 4/3R) silty clay loam, light brownish gray (2.5-5Y 6/2, 2.5Y 5.5/2.5R) when dry, with common medium faint light yellowish-brown mottles; weak medium prisms and weak medium blocks with dark grayish-brown (2.5Y 4.5/2.5, 6/2.5D) thin patchy color coats and thick patchy clay films on vertical ped faces; very hard, firm, sticky, slightly plastic; strongly calcareous; pH 8.2; clear smooth boundary.
IIB32ca	69-97	Dark grayish-brown (2.5Y 4/2, 4/3R) clay loam, grayish brown (2.5Y 5/2, 5Y 6/2R) when dry, with common fine prominent yellowish-brown mottles; very weak coarse prisms breaking to weak angular blocks; thick very patchy clay films on vertical ped faces; very hard, firm, sticky, slightly plastic; strongly calcareous; pH 8.3; gradual smooth boundary.
IICca	97-152	Dark grayish-brown (2.5Y 4/2, 4/3R) clay loam, light brownish gray (2.5Y 6/2, 5Y 7/2R) when dry, with many fine prominent strong brown mottles; massive; very hard, firm, sticky, slightly plastic; strongly calcareous; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.10	43.1	37.8	35.2	30.8	27.3
B21	15-28	1.18	40.7	35.8	32.9	27.3	23.9
B22	28-43	1.19	39.1	35.0	32.1	27.0	23.2
B23ca	43-56	1.28	37.8	33.7	30.8	25.9	23.1
IIB31ca	56-69	1.41	40.0	37.0	34.7	30.8	28.3
IIB32ca	69-97	1.41	48.0	44.8	42.1	37.2	34.0
IICca	97-152	1.36	45.0	41.4	38.3	33.4	30.0

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	16.8	48.0	35.2	2.4	1.6
B21	15-28	13.6	56.2	30.2	2.1	1.5
B22	28-43	13.6	54.2	32.2	2.4	1.8
B23ca	43-56	13.4	50.4	36.2	1.9	1.3
IIB31ca	56-69	21.4	34.4	44.2	1.5	1.1
IIB32ca	69-97	28.4	22.4	49.2	3.2	2.5
IICca	97-152	28.4	22.4	49.2	8.4	6.4
Total available water in profile					21.9	16.2

SOIL PROFILE DESCRIPTION

Soil Type: Kranzburg silty clay loam
Classification: Udic Haploboroll, fine-silty, mixed
Area: Kingsburg County, S. Dak.
Parent Material: Silty glacial drift
Relief: 2-½ percent SE plane slope

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-13	Very dark-brown (10YR 2/2R) silty clay loam, dark grayish brown (10YR 4/2) when dry; cloddy; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 6.4; clear smooth boundary.
B21	13-28	Dark grayish-brown (10YR 4/2.5, 4/2R) silty clay loam, pale brown (10YR 6/3, 1.25Y 5/3R) when dry; weak medium prisms breaking to weak medium blocks with very dark grayish-brown (10YR 3/2.5, 5/3D) thin continuous and very dark-gray (10YR 3/1.5, 5/2D) thin very patchy color coats; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 6.6; gradual smooth boundary.
B22	28-48	Dark-brown (10YR 4/3, 4/2.5R) silty clay loam, pale brown (10YR 6/3.5, 2.5Y 6/3R) when dry; weak medium prisms breaking to weak coarse blocks with dark grayish-brown (10YR 4/2.5, 6/3D) thin continuous color coats; thin very patchy clay films on vertical ped faces; hard, friable, sticky, slightly plastic; noncalcareous; pH 6.8; abrupt smooth boundary.
B31	48-64	Light olive-brown (2.5Y 5/3) silty clay loam, light yellowish brown (2.5Y 6.5/3, 7/4R) when dry; weak medium prisms breaking to weak coarse subangular blocks; hard, friable, sticky, slightly plastic; strongly calcareous; pH 8.0; clear wavy boundary.
B32ca	64-86	Light olive-brown (2.5Y 5/3) silty clay loam, light yellowish brown (2.5Y 6.5/3, 5Y 7/3R) when dry; very weak coarse prismatic structure; very hard, firm, sticky, slightly plastic; strongly calcareous with common medium irregular lime segregations; pH 8.2+; abrupt wavy boundary.

Horizon	Depth	Description
	Cm.	
IICca	86-152	Olive-gray (2.5-5Y 5/2) clay loam, light olive gray (2.5-5Y 6/2) when dry, with many medium faint light olive-brown and common fine prominent yellowish-red and strong brown mottles; very hard, very firm, very sticky, plastic; very strongly calcareous with few fine round lime segregations; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.32	43.9	39.4	36.4	30.6	26.5
B21	13-28	1.22	40.5	36.2	32.9	26.3	23.5
B22	28-43	1.19	38.8	35.4	32.0	25.7	21.4
B31	43-64	1.27	37.1	32.8	29.4	23.1	19.2
B32ca	64-86	1.25	37.7	32.7	29.6	24.1	19.9
IICca	86-152	1.38	40.7	36.1	33.8	29.9	27.6

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	13.6	58.0	28.4	2.2	1.7
B21	13-28	10.6	57.0	32.4	2.6	1.9
B22	28-43	11.6	58.0	30.4	3.5	2.8
B31	43-64	11.6	59.0	29.4	2.7	2.1
B32ca	64-86	11.6	55.2	33.2	4.1	2.9
IICca	86-152	24.6	28.2	47.2	5.4	3.5
Total available water in profile					20.5	14.9

SOIL PROFILE DESCRIPTION

Soil Type: Parnell silty clay loam
Classification: Typic Argiaquoll, fine, mixed, frigid
Area: Kingsbury County, S. Dak.
Parent Material: Local alluvium from silty Cary (Flint) drift
Relief: Flat bottomed

Drainage: Very poorly drained

Horizon	Depth	Description
	Cm.	
Ap	8-0	Black (10YR 2/1R) peaty silty clay loam, dark gray (2.5Y 4/1) when dry; root mat and A1; soft, friable, sticky, plastic; noncalcareous; pH 6.6; clear smooth boundary.
A1	0-23	Very dark-gray (10YR 3/0.5R) silty clay, dark gray (2.5Y 4.5/1) when dry, with common medium distinct dark reddish-brown mottles; weak medium and moderate fine subangular blocky structure; very hard, firm, sticky, very plastic; noncalcareous; pH 6.7; clear wavy boundary.
B2g	23-51	Very dark-gray (1.25Y 3/1, 2.5/2R) silty clay, gray (5Y 5/1, 4.5/1R) when dry; very weak coarse prisms breaking to moderate and strong very fine subangular blocks with thick patchy clay films; very hard, firm, very sticky, very plastic; noncalcareous; pH 7.2; clear wavy boundary.
B3gca	51-97	Very dark-gray (2.5Y 3/1R) silty clay, gray (5Y 5/1) when dry; very weak prisms with thin very patchy clay films on vertical ped faces; very hard, firm, very sticky, very plastic; weakly calcareous with few medium hard lime concretions; pH 7.2; gradual wavy boundary.
C1g	97-132	Very dark-gray (2.5-5Y 3/1) silty clay, gray (5Y 5/0.5) when dry; massive; very hard, firm, very sticky, very plastic; noncalcareous; pH 8.0; diffuse smooth boundary.
C2g	132-152	Very dark-gray (5Y 3/1) silty clay, gray (5Y 5/0.5) when dry; massive; very hard, firm, very sticky, very plastic; noncalcareous; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
O & A1	8-0	–	–	–	–	–	--
A1	0-23	1.32	47.9	45.4	43.4	39.6	37.2
B2g	23-51	1.39	45.3	42.3	40.4	36.8	35.0
B3gca	51-97	1.46	43.8	41.6	39.6	36.2	34.3
C1g	97-132	1.47	43.3	41.1	39.4	36.1	34.3
C2g	132-152	1.45	41.9	40.2	38.6	35.6	33.7

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-23	13.6	40.4	46.0	2.4	1.9
B2g	23-51	10.4	41.6	48.0	2.9	2.1
B3gca	51-97	10.4	41.6	48.0	4.3	3.3
C1g	97-132	9.4	44.6	46.0	3.2	2.4
C2g	132-152	9.4	46.8	43.8	1.7	1.3
Total available water in profile					14.5	11.0

SOIL PROFILE DESCRIPTION

Soil Type: Poinsett silt loam
Classification: Udic Haploborolls, fine-silty, mixed
Area: Kingsbury County, S. Dak.
Parent Material: Silty glacial drift
Relief: 2-¼ percent plane NW slope

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Black (10YR 2/1.5R) silt loam, dark gray (10YR 4/1.5R) when dry; cloddy; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 7.0; abrupt smooth boundary.
B21	18-33	Very dark grayish-brown (10YR 3/2, 3.5/2R) silt loam, dark grayish brown (10YR 4.5/2.5) when dry; weak medium prisms breaking to weak medium blocks with very dark-brown (10YR 2.5/2, 4.5/2D) thin continuous color coats and thin very patchy clay films; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 7.2; clear wavy boundary.
B22	33-51	Dark grayish-brown (1.25Y 4/2) silt loam, brown (1.25Y 5/3) when dry; weak coarse prisms breaking to weak coarse and medium blocks with black (10YR 2/1.5, 4/1.5D) thin very patchy clay films; hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 7.4; abrupt wavy boundary.
B3ca	51-86	Grayish-brown (2.5Y 4.5/3) silt loam, light yellowish brown (1.25Y 6.5/3) when dry, with few fine prominent yellowish-red mottles; very weak very coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; very strongly calcareous with common fine and medium irregular lime segregations; pH 7.8; abrupt smooth boundary.
C1ca	86-102	Gray (5Y 5.5/1) silty clay loam, light gray (5Y 6.5/1) when dry, with many coarse distinct light olive-brown and few fine prominent strong brown mottles; massive breaking to angular fragments of laminated silts, clays, and very fine sands; very hard, firm, sticky, slightly plastic; very strongly calcareous with many medium irregular lime segregations; pH 8.2; abrupt smooth boundary.
Sand band	102	Discontinuous band of dark yellowish-brown (10YR 4/4) loamy coarse sand, with common fine prominent yellowish-red mottles; up to 1-½ inches thick; single grain; loose; very strongly calcareous with many medium lime segregations; pH 8.0; abrupt smooth boundary.
IIC2c	102-152	Olive-gray (5Y 5.5/2) silty clay loam, light gray (5Y 7/2) when dry, with many coarse prominent yellowish-red and yellowish-brown and common coarse distinct light olive-brown mottles; massive breaking to sharply angular laminated fragments; very hard, firm, sticky, slightly plastic; very strongly calcareous; pH 8.0.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.13	43.2	40.3	36.5	29.6	26.5
B21	18-33	1.17	37.3	33.8	30.2	23.5	20.8
B22	33-51	1.24	35.6	30.5	26.9	21.7	19.5
B3ca	51-86	1.31	35.4	30.6	27.7	20.7	18.6
C1ca	86-102	1.37	35.5	32.5	30.2	25.7	23.3
Sand band	102	--	--	--	--	--	--
IIC2c	102-152	1.34	42.2	39.6	37.0	30.9	28.5

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	21.2	57.0	21.8	3.0	2.5
B21	18-33	21.2	55.0	23.8	2.5	2.0
B22	33-51	25.2	51.0	23.8	2.8	2.0
B3ca	51-86	24.2	51.0	24.8	5.9	4.2
C1ca	86-102	17.0	42.8	40.2	1.9	1.4
Sand band	102	--	--	--	--	--
IIC2c	102-152	11.0	44.8	44.2	7.0	5.6
Total available water in profile					23.1	17.7

SOIL PROFILE DESCRIPTION

Soil Type: Prosper clay loam
Classification: Pachic Argiustoll, fine-loamy, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Clay loam glacial till
Relief: Concave

Drainage: Moderately well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Dark-gray (10YR 4/1) light silty clay loam, black (10YR 2/1) when moist; weak fine granular structure; slightly hard when dry, firm when moist; noncalcareous; pH 6.6, abrupt smooth boundary.
A12	15-31	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak coarse subangular blocky breaking to weak fine granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 6.8; gradual wavy boundary.
B21t	31-48	Dark-gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) when moist; weak medium prismatic breaking to weak fine and medium subangular blocky structure; hard when dry; friable when moist; noncalcareous; pH 7.0; clear wavy boundary.
B22t	48-61	Grayish-brown (10YR 5/2) heavy silty clay loam, dark grayish brown (10YR 4/2) when crushed and very dark grayish-brown (10YR 3/2) coated colors when moist; moderate medium prismatic breaking to moderate coarse subangular blocky structure; thin continuous and thin patchy clay film; hard when dry, friable when moist; noncalcareous; pH 7.0; clear wavy boundary.
B23	61-69	Grayish-brown (2.5Y 5/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) when crushed and very dark grayish-brown (2.5Y 3/2) coated colors when moist; moderate medium prismatic breaking to moderate coarse subangular blocky structure; thin continuous and thick patchy clay films; hard when dry, friable when moist; noncalcareous; pH 7.0; clear wavy boundary.
B3ca	69-86	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; few fine faint brownish-yellow (10YR 6/6) mottles when dry; moderate coarse subangular blocky breaking to massive structure; thin patchy clay film; hard when dry, friable when moist; many fine and medium distinct soft lime concretions; strong effervescence; pH 8.2; gradual wavy boundary.
C1ca	86-102	Light-gray (2.5Y 7/2) clay loam, light brownish-gray (2.5Y 6/6) mottles when dry; massive; hard when dry, friable when moist; strong effervescence; pH 8.6; gradual wavy boundary.
C2	102-152	Light-gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) when moist; many fine and medium distinct yellow (2.5Y 7/6) and olive-yellow (2.5Y 6/6) mottles when dry; massive; slightly hard when dry, firm when moist; few fine distinct lime concretions; strong effervescence; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.26	41.1	37.3	34.5	28.4	23.8
A12	15-31	1.11	40.2	35.8	31.8	24.5	19.9
B21t	31-48	1.21	36.4	32.1	29.1	23.8	20.8
B22t	48-61	1.30	36.5	32.4	30.0	25.8	22.5
B23	61-69	1.30	34.4	31.0	28.1	23.1	19.3
B3ca	69-86	1.30	35.9	32.4	29.5	24.4	19.6
C1ca	86-102	1.33	37.0	34.4	30.9	26.6	22.4
C2	102-152	--	--	--	--	--	--

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	28.4	42.2	29.4	2.6	2.1
A12	15-31	30.6	42.0	27.4	3.1	2.4
B21t	31-48	25.6	40.8	33.6	2.8	2.0
B22t	48-61	33.6	30.8	35.6	1.8	1.3
B23	61-69	38.4	26.0	35.6	1.1	.9
B3ca	69-86	30.4	30.0	39.6	2.9	2.3
C1ca	86-102	31.6	30.8	37.6	2.2	1.8
C2	102-152	–	–	–	–	–
Total available water in profile					16.5	12.8

SOIL PROFILE DESCRIPTION

Soil Type: Sinai silty clay loam
Classification: Pachic Udic Haploborolls, fine, montmorillonitic
Area: Kingsbury County, S. Dak.
Parent Material: Silty Cary (Flint) drift
Relief: Upland flat

Drainage: Moderately well drained

Horizon	Depth	Description
	Cm.	
Ap	0-20	Black (10YR 2/0.5) silty clay loam, very dark gray (10YR 3.5/1) when dry, moderate medium and fine granular structure; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 6.7; abrupt smooth boundary.
A1	20-38	Very dark-brown (10YR 2/2 2.5/1R) silty clay loam, dark grayish brown (10YR 4/2, 3.5/1R) when dry; very weak very coarse plates breaking to moderate medium to very fine granules with moderately thick continuous black (10YR 3/1, 3.5/1D) color coats; a few narrow tongues of this horizon extend along ped faces to 36 inches; slightly hard, friable, sticky, slightly plastic; noncalcareous; pH 6.6; clear irregular boundary.
B21	38-53	Very dark grayish-brown (10YR 3/2, 3.5/2R) silty clay loam, grayish brown (10YR 5/2, 4.5/2R) when dry; weak medium prisms breaking to moderate medium blocks with thin continuous very dark-brown (10YR 2/2, 4/2D) color coats and thin patchy and moderately thick patchy clay films; a few narrow tongues of this horizon extend along ped faces to 38 inches; hard, friable, very sticky, plastic; noncalcareous; pH 7.0; clear irregular boundary.
B22	53-71	Dark grayish-brown (2.5Y 4/2.5, 4/2R) silty clay loam, grayish brown (2.5Y 5/3) when dry; moderate medium prisms breaking to moderate medium blocks with thin continuous very dark grayish-brown (1.25Y 3/2, 5/2D) color coats and moderately thick very patchy clay films; hard, firm, very sticky, plastic; noncalcareous; pH 7.2; abrupt wavy boundary.
B3ca	71-94	Light olive-brown (2.5Y 4.5/3) silt loam, pale yellow (2.5Y 6.5/3) when dry; weak coarse prisms breaking to very patchy clay films on vertical ped faces; hard, friable, sticky, plastic; very strongly calcareous with common medium lime segregations; pH 8.2+; gradual wavy boundary.
C1ca	94-122	Olive-gray (5Y 5/2) silt, light gray (5Y 7/2) when dry, with common medium strong brown and few medium prominent very dark-brown mottles; massive breaking to sharply angular laminated fragments; slightly hard, friable, very sticky plastic; very strongly calcareous with many medium lime segregations; pH 8.2+; gradual wavy boundary.
C2cs	122-152	Olive-gray (5Y 5.5/2.5) silt, light gray (5Y 7/1.5) when dry, with many medium and coarse strong brown and yellowish-red and few fine prominent very dark-brown mottles; massive breaking to sharply angular laminated fragments; slightly hard, friable, very sticky, plastic; very strongly calcareous with few fine lime segregations; common medium nests of gypsum; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-20	1.15	43.2	39.6	37.1	32.7	30.8
A1	20-38	1.12	45.4	41.3	38.5	33.0	30.8
B21	38-53	1.28	41.5	38.8	36.9	34.1	32.8
B22	53-71	1.37	42.0	39.2	37.4	34.5	33.2
B3ca	71-94	1.35	37.1	33.4	30.4	26.0	24.2
C1ca	94-122	1.32	40.7	37.1	34.6	29.9	27.3
C2cs	122-152	1.32	42.7	40.3	37.5	32.3	29.2

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-20	14.8	40.0	45.2	2.5	1.8
A1	20-38	14.8	44.0	41.2	2.6	1.9
B21	38-53	12.0	44.0	44.0	1.3	.9
B22	53-71	14.2	42.0	43.8	1.6	1.1
B3ca	71-94	9.2	47.0	43.8	2.9	2.1
C1ca	94-122	8.2	47.0	44.8	3.8	2.7
C2cs	122-152	10.2	50.0	39.8	4.1	3.4
Total available water in profile					18.8	13.9

SOIL PROFILE DESCRIPTION

Soil Type: Sinai silty clay loam
Classification: Pachic Udic Haploborolls, fine, montmorillonitic
Area: Lake County, S. Dak.
Parent Material: Silty glacial drift
Relief: Convex 10 to 20 inches

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Dark-gray and dark grayish-brown (10YR 4/1, 4/2) silty clay loam, black and very dark grayish brown (10YR 2/1, 3/2) when moist; weak fine granular structure; slightly hard when dry, very friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
B21	15-28	Dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; moderate medium prismatic structure breaking to moderate coarse subangular blocks; hard when dry, friable when moist; thin clay films; noncalcareous; pH 7.0; clear wavy boundary.

Horizon	Depth	Description
	Cm.	
B22	28-41	Grayish-brown (2.5Y 5/25) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic structures breaking to moderate coarse subangular blocks; hard when dry, friable when moist; thin clay films; noncalcareous; pH 7.0; clear wavy boundary.
B3ca	41-64	Light brownish-gray (2.5Y 6/2) silty clay loam, dark olive brown to grayish brown (2.5Y 4.5/2) when moist, with few fine distinct yellowish-brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; hard when dry, friable when moist; thin patchy clay films; strong effervescence with moderate fine distinct lime concretions; pH 8.4; gradual wavy boundary.
C1ca	64-86	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (10YR 5/2) with common fine distinct yellowish-red and gray (5YR 4/6, 5Y 5/1) mottles; weak very coarse subangular blocky structure; hard when dry, friable when moist; strong effervescence with common fine distinct lime concretions; pH 8.6; gradual wavy boundary.
C2ca	86-152	Light-gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) when moist, with many fine distinct gray (5Y 6/1), common fine and medium distinct yellowish-brown (10YR 5/6), and few fine distinct strong brown (7.5 YR 3/6) mottles; weak very coarse subangular blocky structure; hard when dry, friable when moist; strong effervescence with few fine distinct lime concretions; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G/cc.*					
Ap	0-15	1.24	49.2	43.8	40.0	30.9	28.0
B21	15-28	1.21	43.7	39.8	36.4	28.3	26.0
B22	28-41	1.24	44.6	41.0	37.5	29.4	27.2
B3ca	41-64	1.35	40.7	35.4	32.4	25.3	22.8
C1ca	64-86	1.28	44.0	39.6	35.7	26.3	23.8
C2ca	86-152	1.29	45.0	40.7	36.8	27.2	24.0

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	13.2	45.6	41.2	3.2	2.4
B21	15-28	13.6	46.2	40.2	2.3	1.8
B22	28-41	11.8	46.0	42.2	2.2	1.8
B3ca	41-64	11.8	43.0	45.2	4.1	2.8
C1ca	64-86	13.4	43.4	43.2	4.6	3.6
C2ca	86-152	14.6	46.2	39.2	13.9	11.1
Total available water in profile					30.3	23.5

SOIL PROFILE DESCRIPTION

Soil Type: Sinai silty clay
Classification: Pachic Udic Haploboroll, fine, montmorilloritic
Area: Kingsbury County, S. Dak.
Parent Material: Lacustrine silts and clays
Relief: Low flat

Drainage: Moderately well to well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Black (10YR 2/1, 2/1.5R) silty clay, dark gray (10YR 4/1, 4.5/1.5R) when dry; weak coarse and very fine granular structure; very hard, friable, sticky, plastic; noncalcareous; pH 6.5; clear wavy boundary.
B21	18-41	Very dark grayish-brown (10YR 3/2, 3.5/2R) silty clay, dark grayish brown (10YR 4/2) when dry; very weak medium prisms breaking to moderate medium and very fine subangular blocks; black (10YR 2.5/1, 4/1D) thin very patchy color coats on vertical ped faces; thin continuous clay films; hard, firm, sticky, plastic; noncalcareous; pH 7.0; gradual irregular boundary.
B22	41-56	Dark grayish-brown (10YR 3.5/2, 4/2R) silty clay loam, brown (1.25Y 5/3, 4/2R) when dry; weak coarse prisms breaking to strong medium subangular blocks with very dark grayish-brown (10YR 3/2, 1.25Y 4.5/2D) thin continuous and black (10YR 2.5/1) thin very patchy color coats; thin continuous clay films; very hard, firm, sticky. plastic; noncalcareous; pH 7.5; clear irregular boundary.
B3ca	56-86	Light olive-brown (2.5Y 5/3) silty clay, light yellowish brown (2.5Y 6/3) when dry; with common fine faint olive-yellow and few fine distinct strong brown and reddish-yellow mottles; weak coarse prisms breaking to moderate coarse and medium subangular blocks; thin very patchy clay films; very hard, firm, sticky, plastic; strongly calcareous with few fine irregular lime segregations; pH 8.0; gradual wavy boundary.
C1ca	86-124	Olive-gray (5Y 5/2) silty clay, light gray (5Y 7/2) when dry, with many medium distinct light olive-borwn, common medium prominent strong brown, common fine prominent dark reddish-brown, and common medium faint olive mottles; massive breaking to sharply angular fragments, varved; extremely hard, very firm, sticky, plastic; very strongly calcareous with common coarse irregular lime segregations; few fine irregular nests of gypsum; pH 8.2; diffuse smooth boundary.
C2ca	124-152	Olive-gray (5Y 5/2) silt, light olive gray (5Y 7/2) when dry, with many coarse prominent yellowish-red, common coarse prominent strong brown, common coarse faint olive, and few fine faint dark olive-gray mottles; massive breaking to sharply angular fragments; varved; extremely hard, firm, slightly sticky, plastic; very strongly calcareous with common fine irregular lime segregations; very few fine irregular nests of gypsum; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-18	1.21	41.2	37.5	35.1	31.8	29.7
B21	18-41	1.29	40.8	37.8	35.7	32.6	31.0
B22	41-56	1.41	42.5	39.2	37.1	34.0	32.4
B3ca	56-86	1.40	38.6	35.3	32.6	28.0	25.7
C1ca	86-124	1.43	40.7	38.1	36.1	31.2	28.0
C2ca	124-152	1.45	40.8	38.4	35.7	31.9	29.9

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-18	16.8	43.8	39.4	2.1	1.4
B21	18-41	8.8	43.8	47.4	2.2	1.5
B22	41-56	8.8	40.8	50.4	1.5	1.0
B3ca	56-86	8.8	42.8	48.4	3.9	2.9
C1ca	86-124	8.8	45.8	45.4	4.8	3.9
C2ca	124-152	12.8	46.8	40.4	3.0	2.4
Total available water in profile					17.5	13.1

SOIL PROFILE DESCRIPTION

Soil Type: Sinai silty clay
Classification: Pachic Udic Haploboroll, fine, montmorillonitic
Area: Kingsbury County, S. Dak.
Parent Material: Lacustrine silts and clays
Relief: Mesalike, flat-topped hill

Drainage: Well to moderately well drained

Horizon	Depth	Description
	Cm.	
Ap	0-13	Black (10YR 2/1.5R) silty clay, very dark gray (10YR 3.5/1) when dry; cloddy; very hard, firm, sticky, slightly plastic; noncalcareous; pH 6.2; abrupt smooth boundary.
A1	13-28	Black, (10YR 2/1R) silty clay, very dark gray (10YR 3/1) when dry; weak coarse granular breaking to moderate very fine subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; noncalcareous; pH 6.6; clear irregular boundary.

Horizon	Depth	Description
	Cm.	
B2	28-56	Very dark grayish-brown (10YR 3/2, 1.25Y 3.5/2R) silty clay, dark grayish brown (1.25Y 4/2) when dry; weak medium prisms breaking to moderate coarse blocks and strong medium subangular blocks with very dark-gray (10YR 3/1, 4/1D) moderately thick continuous color coats and thin distinct continuous clay films; very hard, firm, sticky, plastic; noncalcareous; pH 7.0; clear irregular boundary.
B3	56-79	Dark grayish-brown (2.5Y 4/2, 4.5/2R) silty clay, light brownish gray (2.5-5Y 6/2) when dry; weak coarse prisms breaking to moderate coarse and medium blocks with dark grayish brown (2.5Y 4/1, 5/1D) thin continuous color coats and thin patchy clay films on the vertical ped faces; hard, firm, sticky, plastic; strongly calcareous; pH 8.0; gradual wavy boundary.
C1ca	79-122	Olive-gray (5Y 4.5/2) silty clay, gray (5Y 6/1) when dry, with common coarse prominent yellowish-red, common fine prominent strong brown, and common fine prominent black mottles; massive breaking to sharply angular fragments, some laminated; very hard, firm, sticky, plastic; strongly calcareous with common medium lime segregations; pH 7.9; gradual smooth boundary.
C2	122-152	Olive-gray (5Y 5/2) silty clay, light gray (5Y 7/1) when dry, with common medium prominent black, common fine prominent strong brown, and common coarse prominent yellowish-red mottles; massive; breaking to very angular fragments with very thin laminae of very fine sand and silt; very hard, very firm, sticky, plastic; strongly calcareous; pH 7.8.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.26	44.2	40.8	38.4	34.9	32.3
A1	13-28	1.12	41.8	37.5	35.0	31.5	29.3
B2	28-56	1.29	42.3	40.0	38.3	35.8	34.7
B3	56-79	1.43	40.4	38.0	36.4	33.9	32.6
C1ca	79-122	1.40	40.7	37.5	35.5	32.1	30.9
C2	122-152	1.46	41.6	39.7	37.8	34.6	33.6

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	13.4	42.4	44.2	1.5	1.1
A1	13-28	13.4	40.4	46.2	1.9	1.2
B2	28-56	11.4	36.4	52.2	2.1	1.5
B3	56-79	9.4	36.4	54.2	1.8	1.2
C1ca	79-122	8.4	42.4	49.2	4.3	2.9
C2	122-152	8.4	44.4	47.2	2.4	1.8
Total available water in profile					14.0	9.7

SOIL PROFILE DESCRIPTION

Soil Type: Sinai silty clay loam
Classification: Pachic Udic Haploboroll, fine, montmorillonitic
Area: Lake County, S. Dak.
Parent Material: Stratified silty and clayey sediments
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist, weak fine granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
A12	15-30	Very dark-gray (10YR 3/1) silty clay loam, black (10YR 2/1) when moist; moderate medium and coarse subangular blocky breaking to weak fine granular structure; thin patchy clay films; hard when dry, friable when moist; noncalcareous; pH 6.8; clear wavy boundary.
B2	30-61	Dark grayish-brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) when moist; moderate medium prismatic breaking to moderate and strong fine blocky structure; thin continuous clay film; noncalcareous; pH 7.8; clear wavy boundary.
B3ca	61-79	Light brownish-gray (2.5Y 6/2) light silty clay, grayish brown (2.5Y 5/2) when moist; common fine faint brownish-yellow (10YR 6/6) mottles when dry; weak coarse prismatic breaking to moderate medium and coarse subangular blocky structure; thin patchy clay film; hard when dry, friable when moist; common fine and medium distinct soft lime concretions of strong effervescence; pH 8.4; gradual wavy boundary.
C1ca	79-117	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist; common fine faint gray (5Y 6/1) and common fine faint and distinct brownish-yellow (10YR 6/6) (10YR 6/8) mottles when dry; weak medium and coarse blocky structure; hard when dry, firm when moist; common fine and medium distinct soft lime concretions; strong effervescence; pH 8.4; gradual wavy boundary.
C2	117-152	Brownish-yellow (10YR 6/6) and gray (5Y 6/1) silty clay loam, brown (10YR 5/3) and gray (5Y 6/1) when moist; few fine and medium distinct yellowish-red (5YR 4/8) and common fine distinct black (10YR 2/1) mottles when dry; weak coarse blocky structure; very hard when dry, firm when moist; few fine distinct soft lime concretions; strong effervescence; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.12	43.7	38.8	34.3	29.7	27.1
A12	15-30	1.19	42.1	36.9	33.0	28.4	26.4
B2	30-61	1.34	41.8	37.4	34.2	30.4	28.3
B3ca	61-79	1.45	40.2	35.6	31.3	26.8	24.7
C1ca	79-117	1.37	39.6	35.0	30.4	25.6	23.6
C2	117-152	1.39	41.4	36.8	32.6	28.1	25.8

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 Bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	14.4	46.0	39.6	2.5	1.8
A12	15-30	16.4	41.6	42.0	2.4	1.6
B2	30-61	12.4	45.6	42.0	4.1	2.8
B3ca	61-79	16.4	39.6	44.0	2.7	1.9
C1ca	79-117	15.4	42.6	42.0	5.3	3.8
C2	117-152	19.4	38.6	42.0	5.6	3.9
Total available water in profile					22.6	15.8

SOIL PROFILE DESCRIPTION

Soil Type: Sinai silty clay loam
Classification: Pachic Udic Haploboroll, fine, montmorillonitic
Area: Lake County, S. Dak.
Parent Material: Stratified silty and clayey sediments
Relief: Convex 10 to 20 inches

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-13	Very dark-gray (10YR 3/1) silty clay loam, black (10YR 2/1) when moist; weak fine granular; hard when dry, friable when moist; noncalcareous; pH 6.6; abrupt smooth boundary.
B21	13-33	Dark grayish-brown (2.5Y 4/2) and tongues of very dark-gray (10YR 3/1) silty clay, very dark grayish brown (2.5Y 3/2) and tongues of black (10YR 2/1) when moist; moderate coarse prismatic structure breaking to strong coarse and medium angular blocks; hard when dry, firm when moist; thin continuous clay film; noncalcareous; pH 7.6; gradual wavy boundary.

Horizon	Depth	Description
	Cm.	
B22	33-56	Dark grayish-brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) when moist; strong coarse prismatic structure breaking to strong fine medium and coarse angular blocks; hard when dry, very firm when moist; thin continuous clay film; noncalcareous; pH 7.8; clear irregular boundary.
B22ca	56-71	Grayish-brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) when moist, with common fine and medium distinct black (2.5Y 2/0) mottles; strong coarse angular blocky structure breaking to strong fine angular blocks, hard when dry, very firm when moist; thin continuous clay films; strong effervescence with few fine and medium distinct soft lime concretions; pH 8.0; gradual wavy boundary.
B3ca	71-99	Light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) when moist, with common fine faint brownish-yellow (10YR 6/6) and few medium distinct black (2.5Y 2/0) mottles; strong very coarse blocky structure hard when dry, firm when moist; thin continuous clay films on vertical faces; strong effervescence with many fine and medium distinct soft lime concretions; pH 8.4; gradual wavy boundary.
C1ca	99-127	Light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) when moist, with few medium distinct black (2.5Y 2/0), many fine and medium distinct brownish-yellow (10YR 6/6, 6/8), and few fine prominent yellowish-red (5YR 4/6) mottles; moderate very coarse subangular blocky structure; hard when dry, firm when moist; strong effervescence with common fine and medium soft concretions; pH 8.4; gradual wavy boundary.
C2ca	127-152	Light gray (2.5Y 7/2) silty clay, light brownish gray (2.5Y 6/2) when moist, with many fine and medium distinct brownish-yellow (10YR 6/6), 6/8), common fine and medium distinct black (2.5Y 2/0), and common fine and medium prominent yellowish-red (5YR 4/6) mottles; massive; very hard when dry, firm when moist; strong effervescence; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.16	46.5	43.1	40.0	32.0	29.5
B21	13-33	1.16	46.2	42.5	39.1	31.6	29.4
B22	33-56	1.25	46.2	42.9	40.3	33.4	31.3
B22ca	56-71	1.23	47.1	43.8	40.7	33.5	31.4
B3ca	71-99	1.34	40.9	37.6	34.9	27.9	25.7
C1ca	99-127	1.34	45.0	41.9	38.8	30.5	27.8
C2ca	127-152	--	–	–	–	–	–

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	18.0	44.0	38.0	2.2	1.7
B21	13-33	13.0	42.0	45.0	3.4	2.7
B22	33-56	11.0	38.0	51.0	3.4	2.6
B22ca	56-71	11.0	35.0	54.0	2.4	1.9
B3ca	71-99	16.0	38.0	46.0	4.3	3.3
C1ca	99-127	10.8	41.2	48.0	4.8	3.9
C2ca	127-152	--	--	--	–	–
Total available water in profile					20.5	16.1

SOIL PROFILE DESCRIPTION

Soil Type: Stickney loam
Classification: Glossic Natrustoll, fine-loamy but nearly fine, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Friable loamy glacial drift
Relief: Concave

Drainage: Moderately well drained

Horizon	Depth	Description
	Cm.	
A1	0-9	Black (10YR 2/0.5) silt loam, dark gray (10YR 4/1) when dry; moderate very coarse granular and weak fine platy structure; slightly hard, very friable, sticky, slighty plastic; noncalcareous; pH 6.5; clear smooth boundary.
A2	9-23	Black (10YR 2.5/1) silt loam, dark gray (10YR 4/1) when dry; moderate coarse and weak fine platy structure; slightly hard, very friable, sticky, slightly plastic; noncalcareous; pH 6.6; clear wavy boundary.
B21t	23-36	Black (1.25Y 2.5/1, 2/1R) clay loam, dark gray (1.25Y 4/1) when dry; strong medium prisms breaking to moderate medium blocks with thin patchy clay films on vertical ped faces; blocks tend to break to plates in upper part of horizon; hard, firm, sticky, platic; noncalcareous; pH 6.6; clear wavy boundary.
B22t	36-61	Very dark-gray (2.5Y 3/1) clay loam, dark gray (2.5Y 4/1) when dry; strong medium prisms breaking to strong coarse and medium blocks with moderately thin patchy clay films; hard, firm, very sticky, plastic; noncalcareous; pH 6.8; abrupt wavy boundary.
B3	61-76	Light olive-brown (2.5Y 5/3) clay loam, light yellowish brown (2.5Y) when dry, with many fine faint olive and few fine distinct strong brown mottles; weak coarse prismatic structure; thin continuous clay films in stone pockets; hard, friable, sticky, plastic; strongly calcareous; pH 7.8; gradual wavy boundary.
C1cacs	76-122	Olive-gray (5Y 5.5/2) and light olive-brown (2.5Y 5/4) clay loam; light gray (5Y 7/1) and light yellowish brown (2.5Y 6/4) when dry, with many fine distinct yellowish-brown and common fine prominent black mottles; massive; hard, friable, sticky, plastic, very strongly calcareous with common medium lime segregations; few fine nests of gypsum; pH 8.2; gradual wavy boundary.
C2cs	122-152	Olive-gray (5Y 5.5/2) clay loam, light gray (5Y 7/1) when dry, with many coarse prominent yellowish-brown, common coarse faint light olive-brown, and common fine prominent strong brown mottles; massive; hard, friable, sticky, plastic, very strongly calcareous; common fine nests of gypsum; pH 8.0.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-9	1.05	44.2	40.0	35.4	28.5	26.4
A2	9-23	1.15	42.3	38.2	34.4	28.5	26.7
B21t	23-36	1.32	37.3	34.4	31.7	27.6	26.4
B22t	36-61	1.47	36.7	39.0	31.6	28.0	26.1
B3	61-76	1.50	28.4	26.7	24.7	21.1	19.2
C1cacs	76-122	1.62	28.3	26.1	24.0	20.6	19.1
C2cs	122-152	1.72	28.5	27.1	25.4	22.6	20.8

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-9	26.4	57.8	15.8	1.6	1.2
A2	9-23	23.4	51.8	24.8	2.2	1.6
B21t	23-36	24.6	40.6	34.8	1.4	1.0
B22t	36-61	24.6	41.6	33.8	2.7	3.3
B3c	61-76	40.6	30.6	28.8	1.4	1.1
Clcacs	76-122	45.6	23.6	30.8	4.2	3.2
C2ccs	122-152	39.6	--	--	2.4	1.9
Total available water in profile					15.9	13.3

SOIL PROFILE DESCRIPTION

Soil Type: Stickney loam
Drainage: Moderately well drained
Classification: Glossic Natrustoll, fine, mixed, mesic
Area: Kingsbury County, S. Dak.
Parent Material: Heavy glacial till on Mankato (Flint) ground moraine
Relief: Concave

Horizon	Depth	Description
	Cm.	
Ap (A1&A2)	0-18	Black (10YR 2/1.5R) loam, gray (10YR 5/1, 4.5/1R) when dry; weak medium subangular blocks breaking to very weak fine plates; soft, very friable, sticky, slightly plastic; noncalcareous, pH 6.7; clear smooth boundary.
B2t	18-38	Very dark-gray (10YR 3/1.5, 2.5/1.5R)) clay loam, dark gray (10YR 4.5/1.5, 3.5/1.5R) when dry; strong medium prisms breaking to strong medium blocks with thin patchy clay films; very hard, very firm, very sticky, plastic: noncalcareous; pH 7.2; abrupt wavy boundary.
B2tca	38-66	Brown (10YR 4.5/3, 1.25Y 4/2R) clay loam, pale brown (10YR 6/3, 2.5Y 5.5/2R) when dry; strong medium prisms breaking to strong coarse blocks with dark grayish-brown (2.5Y 4.5/2, 6/2D) moderately thick continuous color coats; thin patchy clay films on vertical ped faces; very hard, very firm, sticky, plastic; strongly calcareous with common fine limesegregations; pH 8.2; gradual wavy boundary.
B3ca	66-99	Dark, and very dark grayish-brown (2.5Y 3/2 and 4/2) clay loam, light brownish gray and light gray (2.5Y 6/2 and 7/2) when dry, with common medium prominent black and few medium distinct dark-gray mottles; weak coarse prisms breaking to weak very coarse blocks; thin very patchy clay films on vertical ped faces; very hard, firm, sticky, plastic; very strongly calcareous with many coarse irregular lime segregations; pH 8.2; gradual wavy boundary.
C1ca	99-132	Olive-gray (5Y 5/2) clay loam, light gray (5Y 7/2) when dry, with many fine prominent black, common medium distinct dark-gray, and few fine prominent yellowish-brown mottles; massive; very hard, firm, very sticky, plastic; very strongly calcareous with few fine round lime segregations; few fine irregular nests of gypsum; pH 8.2; clear smooth boundary.

Horizon	Depth	Description
	Cm.	
C2cs	132-152	Olive (5Y 5/3) clay loam, pale yellow (5Y 7/3) when dry, with many medium distinct light olive-brown, common medium distinct gray, common fine prominent black, and few fine prominent yellowish-red mottles; massive; very hard, firm, very sticky, plastic; strongly calcareous; common medium nests and common coarse threads of gypsum; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap (A1&A2)	0-18	1.10	42.5	38.8	35.1	29.1	26.4
B2t	18-38	1.26	39.9	36.7	33.9	29.5	27.0
B2tca	38-66	1.46	36.2	33.1	30.6	26.2	24.0
B3ca	66-99	1.41	40.6	37.7	35.4	31.5	29.3
C1ca	99-132	1.47	41.2	38.8	36.6	33.8	32.7
C2cs	132-152	1.35	40.7	37.6	36.1	34.2	32.4

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap (A1&A2)	0-18	28.8	52.8	18.4	2.9	2.2
B2t	18-38	30.8	34.8	34.4	2.6	2.0
B2tca	38-66	34.8	24.8	40.4	3.4	2.5
B3ca	66-99	27.8	22.8	49.4	3.8	2.8
Clca	99-132	31.8	21.8	46.4	2.8	2.0
C2cs	132-152	36.8	23.8	39.4	1.7	1.2
Total available water in profile					17.2	12.7

SOIL PROFILE DESCRIPTION

Soil Type: Talmo loam
Classification: Udorthentic Haplustolls, sandy-skeletal, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Outwash sand and gravel
Relief: Convex

Drainage: Excessively drained

Horizon	Depth	Description
	Cm.	
A1	0-18	Very dark-gray (10YR 3/1) loam, black (10YR 2/1) when moist; cloddy breaking to weak fine granular structure; soft when dry, very friable when moist; noncalcareous; pH 8.0; clear wavy boundary.
IIC1ca	18-38	Gray (10YR 5/1) gravel and sand, dark gray (10YR 4/1) when moist; single grain structure; loose when dry, loose when moist; common fine distinct lime concretions; strong effervescence; pH 8.2; clear wavy boundary.
IIC2	38-152	Pale-brown (10YR 6/3) gravel and sand, dark grayish brown (10YR 4/2) when moist; single grain structure; loose when dry, loose when moist; strong effervescence; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-18	1.45	33.1	28.6	23.9	20.2	19.1
IIC1ca	18-38	1.04	37.9	31.9	27.5	23.5	22.9
IIC2	38-152	1.43	8.8	7.2	5.8	5.0	4.6

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-18	66.2	24.8	9.0	2.5	1.7
IIC1ca	18-38	73.2	14.8	12.0	3.0	1.8
IIC2	38-152	88.2	3.8	8.0	4.7	2.9
Total available water in profile					10.2	6.4

SOIL PROFILE DESCRIPTION

Soil Type: Vienna loam
Classification: Udic Haploboroll, fine-loamy, mixed
Area: Kingsbury County, S. Dak.
Parent Material: Superglacial drift over firm glacial till
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-13	Black (10YR 2/1.5R) loam, dark grayish brown (10YR 4/2) when dry; cloddy; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 6.6; abrupt smooth boundary.
B21	13-25	Very dark grayish-brown (10YR 3/2.5, 3/2R) loam, dark grayish brown (10YR 4/2.5) when dry; weak fine prisms breaking to moderate medium blocks with black (10YR 2.5/1, 3.5/1D) thin patchy color coats; moderately thick patchy clay films; hard, firm, slightly sticky, slightly plastic; noncalcareous; pH 7.0; clear smooth boundary.
B22	25-41	Dark-brown (10YR 3.5/3, 3/3R) clay loam, brown (10YR 5/3) when dry; weak medium prisms breaking to moderate medium blocks with very dark grayish-brown (10YR 3/2.5) thin continuous color coats and moderately thick patchy clay films; very hard, firm, slightly sticky, slightly plastic; noncalcareous; pH 7.2; abrupt wavy boundary.
IIB31	41-48	Yellowish-red (5YR 5/8) gravelly clay loam, with many medium prominent light brownish-gray and olive-brown mottles; very weak very fine subangular blocky structure; slightly hard, very friable, strongly calcareous with common fine hard lime pebbles; pH 7.6; abrupt wavy boundary.
IIIB32	48-81	Olive-brown (2.5Y 4/4) silty clay, light yellowish brown (2.5Y 6/4) when dry; weak coarse prisms breaking to weak coarse blocks with very dark grayish-brown (2.5Y 3.5/2, 5Y 5.5/1D) thin continuous color coats and thick patchy clay films; very hard, firm, sticky, plastic; strongly calcareous with many medium lime segregations; pH 7.8; gradual wavy boundary.
IIIC1ca	81-122	Light olive-brown (2.5Y 5/3) clay, light yellowish brown (2.5Y 6.5/3) when dry, with common fine prominent yellowish-red and common medium distinct olive-gray mottles; massive; very hard, firm, sticky, plastic; very strongly calcareous; pH 7.8; gradual smooth boundary.
IIIC2ca	122-152	Olive-gray (5Y 4.5/2) clay, light olive gray (5Y 6/2) when dry, with common fine prominent yellowish-red and many medium distinct black mottles; massive; very hard, extremely firm, sticky, plastic; strongly calcareous; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.30	40.8	37.8	35.2	30.2	27.3
B21t	13-25	1.33	41.2	37.5	35.0	30.6	28.6
B22t	25-41	1.40	33.4	30.0	26.2	22.2	20.9
IIB31	41-48	–	–	–	–	–	–
IIIB32	48-81	1.46	40.2	36.9	34.7	31.2	29.0
IIIC1ca	81-122	1.46	41.7	38.8	36.4	32.8	30.6
IIIC2ca	122-152	1.45	47.2	44.1	42.2	38.5	35.9

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	30.8	38.8	30.4	1.7	1.3
B21t	13-25	35.8	29.8	34.4	1.6	1.1
B22t	25-41	44.2	25.8	30.0	1.9	1.2
IIB31	41-48	78.8	8.8	12.4	–	–
IIIB32	48-81	27.8	21.8	50.4	3.7	2.6
IIIC1ca	81-122	28.8	19.8	51.4	4.5	3.2
IIIC2ca	122-152	22.8	17.8	59.4	3.5	2.5
Total available water in profile					16.9	11.9

SOIL PROFILE DESCRIPTION

Soil Type: Viborg silty clay loam
Classification: Pachic Haplustolls, fine-silty, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty material overlying glacial till
Relief: Concave

Drainage: Moderately well drained

Horizon	Depth	Description
	Cm.	
Ap	0-18	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak fine granular structure; hard when dry, very friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
B21	18-36	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak to moderate medium and coarse prismatic structure breaking to weak coarse subangular blocks; slightly hard when dry; friable when moist; noncalcareous; pH 7.0; gradual wavy boundary.
B22	36-53	Grayish-brown (2.5Y 5/2) and tongues of dark-gray (10YR 4/1) silty clay loam, dark grayish brown (2.5Y 4/2) and tongues of black (10YR 2/1) when moist; moderate medium prismatic structure breaking to weak medium and coarse subangular blocks; hard when dry, friable when moist; thin patchy clay film; noncalcareous with few fine distinct lime concretions; pH 7.2; clear wavy boundary.
B3ca	53-86	Light brownish-gray (2.5Y 6/2.5) silty clay loam, grayish brown (2.5Y 5/2.5) when moist; moderate coarse and very coarse subangular blocky structure; hard when dry, friable when moist; thin patchy clay films; strong effervescence with many fine and medium distinct soft lime concretions; pH 8.0; gradual wavy boundary.
Cca	86-122	Light-gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) when moist, with many fine faint and distinct brownish-yellow (10YR 6/6, 6/8) mottles; massive; hard when dry, friable when moist; strong effervescence with many fine and medium distinct soft lime concretions; pH 8.2; clear wavy boundary.
IICca	122-152	Light-gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) when moist, with few fine prominent yellowish-red (5YR 5/8), many fine faint and distinct brownish-yellow (10YR 6/6), and few fine distinct black (2.5Y 2/0) mottles; massive; hard when dry, firm when moist; strong effervescence with common fine distinct lime concretions; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.13	48.3	43.0	38.8	30.8	28.1
B21	18-36	1.19	45.3	40.0	35.9	27.5	24.3
B22	36-53	1.15	42.6	38.6	34.7	26.9	24.0
B3ca	53-86	1.15	38.7	34.2	30.4	23.7	20.7
Cca	86-122	1.31	42.5	37.0	32.5	24.3	21.0
IICca	122-152	--	--	--	--	--	--

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	15.4	55.0	29.6	3.6	2.7
B21	18-36	13.2	55.2	31.6	3.7	2.8
B22	36-53	15.4	51.0	33.6	3.3	2.6
B3ca	53-86	14.2	52.0	33.8	6.0	4.5
Cca	86-122	14.6	53.6	31.8	7.6	5.7
IICca	122-152	--	--	--	--	--
Total available water in profile					24.2	18.3

SOIL PROFILE DESCRIPTION

Soil Type: Viborg silty clay loam
Classification: Pachic Haplustolls, fine-silty, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty material overlying glacial till
Relief: Convex
Drainage: Moderately well to well drained

Horizon	Depth	Description
	Cm.	
Ap	0-20	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; cloddy breaking to weak fine granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
B21	20-38	Dark grayish-brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) when moist; weak coarse prismatic breaking to moderate coarse subangular blocky structure; slightly hard when dry, friable when moist; few thin patchy clay films; noncalcareous; pH 7.2; gradual wavy boundary.

Horizon	Depth	Description
	Cm.	
B22	38-53	Grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; weak to moderate coarse and very coarse prismatic breaking to moderate coarse subangular blocky structure; slightly hard when dry, friable when moist; thin patchy clay films; noncalcareous; pH 7.8; clear wavy boundary.
B3ca	53-69	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish-brown (10YR 5/6) mottles when dry; moderate coarse and very coarse subangular blocky structure; slightly hard when dry, friable when moist; thin patchy clay films; common fine and medium distinct soft lime concretions; strong effervescence; few medium distinct iron concretions; pH 8.6; gradual wavy boundary.
Cca	69-89	Light brownish-gray (2.5Y 6/2) silty clay loam, grayish-brown (2.5YR 5/2) when moist, common fine faint brownish-yellow (10YR 6/8) mottles when dry; massive; slightly hard when dry, friable when moist; many fine and medium distinct soft lime concretions; strong effervescence; pH 8.4; gradual wavy boundary.
IIC	89-152	Light, brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) when moist, few fine distinct black (2.5Y 2/0) and common fine faint yellowish-brown (10YR 5/6) mottles when dry; massive structure; hard when dry, firm when moist, common fine distinct and few medium distinct soft lime concretions; strong effervescence; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-20	1.11	42.8	36.7	33.4	29.9	27.7
B21	20-38	1.18	41.1	34.2	30.3	25.4	23.0
B22	38-53	1.19	39.3	32.8	29.3	24.8	22.7
B3ca	53-69	1.24	36.2	33.2	30.3	22.6	18.2
Cca	69-89	1.31	37.4	34.1	31.8	23.7	18.5
IIC	89-152	1.29	36.1	33.1	30.4	25.6	22.2

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-20	21.4	49.0	29.6	3.0	1.8
B21	20-38	13.4	56.2	30.4	3.2	2.0
B22	38-53	17.4	51.0	31.6	2.5	1.5
B3ca	53-69	17.6	50.8	31.6	2.7	2.3
Cca	69-89	16.6	51.8	31.6	3.8	3.2
IIC	89-152	24.6	29.6	45.8	8.8	6.9
Total available water in profile					24.0	17.7

SOIL PROFILE DESCRIPTION

Soil Type: Waubay silty clay loam
Drainage: Moderately well to imperfectly drained
Classification: Pachic Udic Haploboroll, fine, mixed, frigid
Area: Kingsbury County, S. Dak.
Parent Material: Local alluvium from silty drift over silty drift of Cary (Flint) age
Relief: Concave

Horizon	Depth	Description
	Cm.	
Ap	0-15	Black (10YR 2/1R) silty clay loam, very dark gray (10YR 3.5/1R) when dry; very weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 6.7; abrupt smooth boundary.
All	15-25	Black (10YR 2/1R) silty clay loam, very dark gray (10YR 3.5/1R) when dry; weak very coarse and very weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 6.6; gradual wavy boundary.
A12 (A2B2)	25-36	Black (10YR 2/1.5, 2.5/1R) silt loam, dark gray (10YR 4/1, 4/1.5R) when dry; very weak very coarse plates breaking to weak medium and fine subangular blocks, thin very patchy gray (10YR 5/1) dry color coats; thin very patchy coatings of clear angular quartz; hard, friable, slightly sticky, slightly plastic; noncalcareous; pH 6.6; clear wavy boundary.
B21	36-53	Very dark-brown (10YR 2/2, 2.5/1R) silty clay loam, dark grayish brown (10YR 4/2, 4/1R) when dry; weak medium prisms breaking to moderate angular blocks; with thin continuous black (10YR 2/1.5, 4/1D) color coats and thin patchy clay films; hard, firm, slightly sticky, slightly plastic; noncalcareous; pH 6.6; clear wavy boundary.
B22	53-76	Very dark-brown (10YR 2/2, 2.5/1.5R) silty clay loam, dark grayish bown (10YR 4/2, 4/1R) when dry; weak medium prisms breaking to weak to moderate coarse blocks with thin continuous black (10YR 2/1, 4/1D) color coats; thin continuous clay films on vertical ped faces; very hard, firm, slightly sticky, slightly plastic; noncalcareous; pH 7.2; abrupt wavy boundary.
B23cs	76-91	Dark grayish-brown (2.5Y 4/2, 10YR 2.5/2R) silty clay loam, grayish brown (2.5Y 5/2) when dry; weak coarse prisms breaking to weak medium blocks with very dark grayish-brown (1.25Y 3/2, 5/2D) thin continuous clay films on vertical ped faces; very hard, firm, slightly sticky, slightly plastic; noncalcareous; common fine nests of gypsum; pH 8.2; clear wavy boundary.
B3cs	91-107	Light olive-brown (2.5Y 5/4) silt loam, light yellowish brown (2.5Y 6/4) when dry, with few fine distinct yellowish-brown mottles; very weak coarse prisms breaking to very weak medium blocks; hard, friable, slightly sticky, slightly plastic; weakly calcareous; few fine nests of gypsum; pH 8.2+; clear wavy boundary.
C1	107-122	Olive (5Y 5/3) silt loam, pale olive (5Y 6/3) when dry, with few fine distinct yellowish-brown mottles; massive; slightly hard, friable, slightly sticky, slightly plastic; strongly calcareous; pH 8.2+; clear wavy boundary.
C2	122-152	Olive (5Y 5/3) silt, pale yellow (5Y 7/3) when dry, with common medium prominent yellowish-brown and common medium distinct light olive-brown mottles; massive; slightly hard, friable, slightly sticky, slightly plastic; strongly calcareous; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.21	45.3	41.0	38.1	33.2	30.5
A11	15-25	1.18	43.0	38.5	35.9	31.4	28.2
A12 (A2B2)	25-36	1.11	38.6	34.7	31.3	26.4	23.5
B21	36-53	1.29	42.4	39.0	36.5	33.2	30.8
B22	53-76	1.38	42.1	39.2	37.2	34.2	31.1
B23cs	76-91	1.34	39.3	36.8	34.9	32.1	30.0
B3cs	91-107	1.37	40.1	36.9	35.2	32.1	30.1
C1	107-122	1.37	40.4	36.9	35.2	32.4	30.0
C2	122-152	1.37	40.3	37.0	34.9	31.9	29.2

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	14.8	49.8	35.4	2.3	1.6
All	15-25	14.8	49.6	35.6	1.5	1.0
A12 (A2B2)	25-36	14.6	52.0	33.4	1.5	1.1
B21	36-53	12.4	50.0	37.1	2.1	1.5
B22	53-76	11.2	47.6	41.2	2.5	1.8
B23cs	76-91	12.2	47.6	40.2	1.4	1.0
B3cs	91-107	9.0	55.8	35.2	1.5	1.0
C1	107-122	9.0	56.8	34.2	1.6	1.0
C2	122-152	9.0	60.8	30.2	3.4	2.4
Total available water in profile					17.8	12.4

SOIL PROFILE DESCRIPTION

Soil Type: Wentworth silt loam
Classification: Udic Haplustoll, fine-silty, mixed, mesic
Area: Lake County, S. Dak.
Parent Material: Silty glacial drift
Relief: Convex

Drainage: Well drained

Horizon	Depth	Description
	Cm.	
Ap	0-15	Very dark-gray (10YR 3/1) silt loam, black (10YR 2/1) when moist; cloddy breaking to moderate fine and medium granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
B21	15-33	Grayish-brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic breaking to weak moderate and coarse subangular blocky structure; slightly hard when dry, friable when moist; noncalcareous; pH 7.6; gradual wavy boundary.
B22	33-56	Grayish-brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; moderate medium prismatic breaking to moderate coarse subangular blocky structure; slightly hard when dry,friable when moist; noncalcareous; thin patchy clay films; pH 8.0; clear wavy boundary.
B3ca	56-76	Light brownish-gray (2.5Y 6/2) silty clay loam; grayish brown (2.5Y 5/2) when moist, few fine faint and few medium distinct brownish-yellow (10YR 6/8) mottles when dry; moderate coarse subangular blocky structure; hard when dry, friable when moist; common fine and medium distinct soft lime concretions; strong effervescence; few threadlike iron concretions; thin patchy clay film; pH 8.6; clear wavy boundary.
C1ca	76-122	Light brownish-gray (2.5Y 6/2) silty clay loam; grayish brown (2.5Y 5/2) when moist, common fine faint and common medium distinct brownish-yellow (10YR 6/8) mottles when dry; moderate coarse and very coarse subangular blocky structure; hard when dry, friable when moist; many fine and medium distinct soft and hard lime concretions; strong effervescence; many large iron concretions and few threadlike iron concretions; pH 8.6; gradual wavy boundary.
C2	122-152	Light yellowish-brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) when moist, common medium distinct brownish-yellow (10YR 6/8) and yellowish-brown (10YR 5/8) and many fine faint brownish-yellow (10YR 6/6) mottles when dry; massive; hard when dry, firm when moist; common fine and medium distinct soft lime concretions; strong effervescence; few small iron concretions; pH 8.6.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	1.19	47.9	44.3	36.3	29.6	26.8
B21	15-33	1.09	40.3	32.6	27.7	22.6	21.3
B22	33-56	1.18	37.7	32.3	27.6	22.8	21.8
B3ca	56-76	1.26	37.3	32.1	27.5	22.2	20.8
C1ca	76-122	1.30	37.4	31.4	27.1	21.9	21.1
C2	122-152	–	–	–	–	–	–

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	26.8	46.8	26.4	3.2	2.7
B21	15-33	21.8	54.8	23.4	3.4	2.0
B22	33-56	17.6	52.0	30.4	3.6	2.4
B3ca	56-76	17.6	49.0	33.4	3.4	2.3
Clca	76-122	20.6	49.0	30.4	7.5	4.7
C2	122-152	–	–	--	--	--
Total available water in profile					21.1	14.1

SOIL PROFILE DESCRIPTION

Soil Type: Whitewood silty clay loam Drainage: Moderately well to somewhat poorly drained
Classification: Cumlic Haplaquoll, fine-silty, mixed, noncalcareous, mesic
Area: Lake County, S. Dak.
Parent Material: Silty alluvium overlying glacial till
Relief: Concave 10 to 20 inches

Horizon	Depth	Description
	Cm.	
Ap	0-18	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak fine granular structure; hard when dry, friable when moist; noncalcareous; pH 6.8; abrupt smooth boundary.
A12	18-38	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak very coarse subangular blocky structure breaking to weak fine granules; slightly hard when dry, friable when moist; noncalcareous; pH 6.8; clear wavy boundary.
B21	38-61	Dark-gray (10YR 4/1) silty clay loam, black (10YR 2/1) when moist; weak and moderate very coarse subangular blocky structure breaking to moderate coarse subangular blocks; hard when dry, friable when moist; thin patchy clay film; noncalcareous; pH 7.0; gradual wavy boundary.
B22	61-86	Light brownish-gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) when moist; weak coarse prismatic structure breaking to weak and moderate medium and coarse subangular blocks; hard when dry, friable when moist; thin patchy clay films; noncalcareous; pH 7.0; gradual wavy boundary.
B23	86-109	Light olive-gray (5Y 6/2) silty clay loam, with common fine faint brownish-yellow (10YR 6/6) mottles; olive gray (5Y 5/2) with common fine faint yellowish brown (10YR 5/6) mottles when moist; moderate medium prismatic structure breaking to weak and moderate coarse subangular blocks; hard when dry, friable when moist; thin patchy clay films; noncalcareous; pH 7.0, clear wavy boundary.
B3ca	109-132	Light-gray (5Y 7/2) silty clay loam, with many fine and medium distinct brownish-yellow (10YR 6/6) mottles; olive gray (5Y 5/2) with many fine and medium yellowish-brown (10YR 5/8) mottles when moist; weak and moderate coarse subangular blocky structure breaking to weak fine and medium subangular blocks; hard when dry, friable when moist; strong effervescence with few fine and medium distinct lime concretions; pH 8.0; clear wavy boundary.
IICcacs	132-152	Light-gray (5Y 7/2) clay loam, with many fine and medium distinct brownish-yellow (10YR 6/6) and few medium prominent reddish-brown (5Y 4/4) mottles; olive gray (5Y 5/2) with many fine and medium distinct yellowish-brown (10YR 5/8), few medium prominent yellowish-red (5YR 4/8), and many fine and medium distinct black (2.5Y 2/0) mottles when moist; massive; very hard when dry, firm when moist; few to common gypsum nests; strong effervescence with many fine and medium distinct lime concretions; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-18	1.10	47.2	41.1	37.9	29.8	26.8
A12	18-38	1.10	41.5	37.2	34.8	26.5	24.0
B21	38-61	1.18	41.5	37.5	34.3	27.7	25.4
B22	61-86	1.26	40.7	36.6	33.6	27.2	23.5
B23	86-109	1.25	40.9	36.3	32.5	23.9	21.1
B3ca	109-132	1.30	39.9	36.2	32.1	23.7	20.2
IICcacs	132-152	1.30	39.0	34.4	31.4	23.7	21.7

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-18	18.2	52.4	29.4	3.6	2.6
A12	18-38	18.2	52.4	29.4	3.6	2.7
B21	38-61	17.0	49.2	33.8	3.7	2.7
B22	61-86	15.0	51.2	33.8	4.4	3.3
B23	86-109	20.0	48.2	31.8	4.5	3.5
B3ca	109-132	19.0	48.2	32.8	4.5	3.7
IICcacs	132-152	29.0	25.2	45.8	3.5	2.6
Total available water in profile					27.8	21.1

SOIL PROFILE DESCRIPTION

Soil Type: Worthing silty clay loam
Drainage: Poorly drained
Classification: Typic Argiaquolls, fine, montmorillonitic, noncalcareous, mesic
Area: Lake County, S. Dak.
Parent Material: Local clayey alluvium
Relief: Concave

Horizon	Depth	Description
	Cm.	
Ap	0-15	Very dark-gray (10YR 3/1) silty clay loam, black (10YR 2/1) when moist; cloddy breaking to weak fine granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 7.6; abrupt smooth boundary.
A12	15-30	Very dark-gray (10YR 3/1) silty clay loam, black (10YR 2/1) when moist; weak coarse subangular blocky breaking to weak fine granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 8.0; gradual wavy boundary.
B21t	30-56	Very dark-gray (10YR 3/1) silty clay loam, black (10YR 2/1) when moist; moderate coarse subangular blocky breaking to weak fine granular structure; slightly hard when dry, friable when moist; noncalcareous; pH 8.0; gradual wavy boundary.
B22t	56-94	Dark-gray (10YR 4/1) silty clay, black (10YR 2/1) when moist; moderate coarse subangular blocky breaking to moderate medium subangular blocky structure; thin continuous clay films; hard when dry, friable when moist; noncalcareous; pH 8.2; gradual wavy boundary.
B23t	94-137	Dark-gray (10YR 4/1) silty clay, black (10YR 2/1) when moist; strong coarse subangular blocky breaking to strong fine blocky structure; thin continuous clay film; very hard when dry, firm when moist; pH 8.2; clear wavy boundary.
Cg	137-152	Light brownish-gray (10YR 6/2) silty clay loam, black (10YR 2/1) when moist; many fine distinct pale-brown (10YR 6/3) mottles when dry, brown (10YR 5/3) mottles when moist; massive; very hard when dry, firm when moist; noncalcareous; pH 8.2.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-15	0.94	49.7	42.7	37.9	34.8	32.1
A12	15-30	.96	51.3	45.7	42.2	35.6	31.5
B21t	30-56	1.13	50.1	45.5	42.1	35.5	31.6
B22t	56-94	1.22	46.1	40.4	36.2	30.3	26.9
B23t	94-137	1.47	44.3	39.7	36.7	31.4	28.6
Cg	137-152	–	–	–	–	–	–

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-15	1.4	61.0	37.6	2.2	1.3
A12	15-30	11.4	32.0	56.6	3.0	2.2
B21t	30-56	13.4	44.0	42.6	4.7	3.5
B22t	56-94	23.6	37.8	38.6	7.3	5.1
B23t	94-137	22.6	38.8	38.6	6.8	4.8
Cg	137-152	--	--	--	--	--
Total available water in profile					24.0	16.9

SOIL PROFILE DESCRIPTION

Soil Type: Worthing silty clay loam
Classification: Typic Argiaquolls, fine, montmorillonitic, mesic
Area: Lake County, S. Dak.
Parent Material: Local clayey alluvium
Relief: Concave

Drainage: Poorly drained

Horizon	Depth	Description
	Cm.	
A1	0-20	Very dark-gray (10YR 3/1) silty clay loam, black (10YR 2/1) when moist; weak fine granular structure; hard when dry, friable when moist; noncalcareous; pH 7.0; abrupt smooth boundary.
B21t	20-46	Very dark-gray (10YR 3/1) silty clay, black (10YR 2/1) when moist; moderate coarse and very coarse subangular blocky breaking to moderate medium subangular blocky structure; thin continuous clay film; hard when dry, firm when moist; noncalcareous; pH 7.0; gradual wavy boundary.
B22t	46-69	Very dark-gray (10YR 3/1) silty clay, black (10YR 2/1) when moist; strong coarse and very coarse subangular blocky structure breaking to strong fine angular blocks; thin continuous clay film; hard when dry, firm when moist; few medium and coarse distinct soft lime concretions; matrix noncalcareous; pH 7.2; gradual wavy boundary.
B2gcs	69-107	Dark-gray (5Y 4/1) silty clay, black (10YR 2/1) when moist; strong very coarse subangular blocky breaking to strong fine angular blocky structure; thin continuous clay films; very hard when dry, firm when moist; many small gypsum nests; noncalcareous; pH 7.8; gradual wavy boundary.
Cgca	107-152	Light-gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) when moist; massive; very hard when dry, firm when moist; strong effervescence; pH 8.4.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
A1	0-20	1.11	52.9	47.4	43.4	35.1	33.0
B21t	20-46	1.30	48.4	42.3	39.2	33.5	31.5
B22t	46-69	1.34	51.4	46.0	42.4	35.7	33.9
B2gcs	69-107	1.36	51.9	46.4	43.1	36.0	33.5
Cgca	107-152	--	--	--	--	--	--

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
A1	0-20	16.6	45.2	38.2	4.0	2.9
B21t	20-46	12.6	40.2	47.2	4.3	2.7
B22t	46-69	10.6	40.2	49.2	3.9	2.8
B2gcs	69-107	13.6	48.0	38.4	7.0	4.9
Cgca	107-152	--	--	--	--	--
Total available water in profile					19.2	13.3

SOIL PROFILE DESCRIPTION

Soil Type: Unnamed silty clay loam
Drainage: Poorly drained
Classification: Typic Calciaquolls, fine, mixed, frigid
Area: Kingsbury County, S. Dak.
Parent Material: Alluvium from silty drift of Cary (Flint) age over firm glacial till
Relief: Flat-bottomland

Horizon	Depth	Description
	Cm.	
Ap	0-13	Very dark-gray (2.5Y 3/1R) silty clay loam, dark gray (2.5Y 4.5/1R) when dry; cloddy; hard, friable, slightly sticky, slightly plastic; strongly calcareous; pH 7.7; abrupt smooth boundary.
A12	13-30	Dark grayish-brown (2.5Y 4/2, 3.5/1.5R) silty clay loam, gray (5Y 5/1) when dry; weak coarse blocky and granular structure; hard, friable, sticky, slightly plastic; very strongly calcareous, pH 8.1; clear irregular boundary.
C1ca	30-54	Olive-gray (5Y 5/2.5) silty clay loam, light gray (5Y 7/2) when dry, with many coarse distinct dark grayish-brown and light yellowish-brown and common fine faint light olive-brown mottles; weak medium prisms breaking to weak coarse and medium blocks; hard, friable, sticky, slightly plastic; very strongly calcareous; pH 8.2; clear irregular boundary.
C2ca	54-74	Olive-gray (5Y 5.5/2) silty clay, light gray (5Y 7/1.5) when dry, with common fine distinct light olive-brown and olive-yellow mottles; very weak coarse prismatic structure; hard, friable, sticky, slightly plastic; strongly calcareous with common medium lime segregations; pH 8.2; gradual wavy boundary.
IICcacs	74-152	Olive-gray (5Y 5/2), dark olive-gray (5Y 3/2), and olive-brown (2.5Y 4/4) clay loam; with common fine prominent black and few fine prominent yellowish-red mottles; massive; very hard, firm, slightly sticky, slightly plastic; strongly calcareous; many fine nests of gypsum; pH 8.2+.

WATER RELEASE DATA

Horizon	Depth	Bulk density	Percent water at respective tensions				
			1/10 Bar	1/3 Bar	1 Bar	5 Bars	15 Bars
	Cm.	*G./cc.*					
Ap	0-13	1.08	38.4	35.0	32.6	28.6	27.1
A12	13-30	1.46	38.6	35.5	32.9	28.6	26.9
C1ca	30-54	1.41	38.1	33.8	30.9	25.1	22.3
C2ca	54-74	1.53	38.8	35.3	33.1	28.7	25.9
IICcacs	74-152	1.42	41.0	39.1	37.2	34.3	32.4

AVAILABLE WATER AND PARTICLE SIZE DISTRIBUTION

Horizon	Depth	Particle size			Available water in horizon	
		Sand	Silt	Clay	1/10 Bar to 15 bars	1/3 Bar to 15 bars
	Cm.	*Pct.*	*Pct.*	*Pct.*	*Cm.*	*Cm.*
Ap	0-13	12.8	48.8	38.4	1.4	1.0
A12	13-30	16.8	46.8	36.4	2.1	1.5
C1ca	30-54	13.8	49.8	36.4	4.0	2.9
C2ca	54-74	19.8	39.8	40.4	2.3	1.7
11Ccacs	74-152	27.8	21.8	50.4	2.4	1.9
Total available water in profile					12.2	9.0